THE UNIVERSITY OF ALBERTA

OFFER CURVE ANALYSIS IN WAGE THEORY

by

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The undersigned certify that they have read and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "Offer Curve Analysis in Wage Theory," submitted by Jack Gordon Beach, in partial fulfilment of the requirements for the degree of Master of Arts.

ABSTRACT

Although wage-employment contracts are determined in the labor market, there is not a completely general explanation of their determination. Circumstances such as market conditions establish the framework within which contracts are concluded: behavioral aspects influence the nature of the solution. Within certain market structures, rational behavior by the contracting parties yields a determinate solution while, in other situations, solutions are indeterminate since the positions chosen, on the basis of rationality, are incompatible. Static contract theory describes the solutions, whether determinate or indeterminate, and dynamic bargaining theory describes the process of arriving at a solution.

This examination of contract theory shows the productivity theory to be a versatile approach for considering certain aspects of wage-employment contracts but to have certain limitations. An alternative, offer curve analysis, is developed by two dimensional geometry and shown to have some advantages over traditional marginal analysis. These advantages are primarily in the making of ex post inferences about circumstances on the basis of the theoretical model.

ACKNOWLEDGEMENT

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J. G. Beach

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CHAPTER I

INTRODUCTION

In spite of the prevalence of wage theories, none can claim to provide an adequate explanation of the process of wage determination. The overriding purpose of each is to establish the forces giving rise to the level of earnings of labor and the character of each theory is partly influenced by the economic and social problems of the time. The wage-fund and subsistence theories were influenced by the economic condition of labor and the understanding of economic forces. The productivity theory arose from the search for a general theory of value and the popularity of marginalism as an analytical device. Bargaining theories were conditioned by the prominence of wage-setting institutions and the inability of previously existing theories to fully incorporate the influence of unions in their models. While there has not been an accumulation of theoretical knowledge dedicated to a particular type of solution, there have been attempts to adapt particular approaches to alternative uses. Aspects of the received theories have contributed to the current understanding of the wage-making process.

The problem of wage theory is to set out the fundamental influences that give rise to a wage level. While observation shows the rate of payment to labor to be determined by conditions of the labor market, the abstract models of existing theories do not give a

perfectly general explanation of the establishment of an actual solution. Theoretical models explain the role of certain types of influences but the present state of wage theory is such that the major forces, according to each theory, are not embodied in one general theory. Received wage theories can be roughly categorized as being institutional and market oriented, the former having a dynamic flavor, and successful attempts at integrating these are not available. While this thesis is not directed specifically to this problem, an attempt is made to develop a model that would facilitate a consolidation of available information.

The presence of wage-setting institutions makes the subsistence and wage-fund theories incompatible with reality. These theories can, therefore, be ignored because they are not adaptable to the framework of the labor market. The marginal productivity theory of wages provides a method for setting out the demand aspect of the labor market. While the doctrine is essentially a theory of demand, it is a useful approach for establishing the roles of product and labor market conditions as they affect the employment contract. Since the demand for a factor derives from its productivity, the theory of production plays a major part in the derivation of the factor demand. According to the Law of Variable Proportions, diminishing returns to the variable factor set in and the marginal increment in output resulting from hiring an additional unit of input becomes smaller as more units are hired. While the marginal increment in output is greater than the cost of its production, the employer continues to hire more units of the variable factor.

The demand for a factor can be more generally stated when the output of a variable input is quoted in money terms. F. Machlup[1] argues that the marginal revenue product is the most acceptable measure of the contribution of factor units, and E. H. Chamberlin[2] shows the necessity of such a concept if the productivity theory is to be applied to perfect and imperfect competition. The extension of the productivity theory to imperfect competition enables comparisons to be made among wage rates and levels of employment that arise from varying degrees of product market competition. These comparisons make it possible to deduce the effect of market forces on the terms of employment, which is one task of this thesis. The presentations of the productivity theory by Chamberlin[3], Robinson[4] and Rothschild[5] are typical of the attempts to generalize the marginal productivity theory by relaxing certain of its assumptions and making it a useful addition to the general theory of value.

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[1]F. Machlup, "On The Meaning of The Marginal Product", reprinted in Readings In The Theory of Income Distribution, ed. W. Fellner and B. Haley (Homewood: R. D. Irwin, Inc., 1951).

[2]E. H. Chamberlin, The Theory of Monopolistic Competition, (8th. ed.; Cambridge: Harvard University Press, 1962) chap. viii.

[3]Ibid.

[4]J. Robinson, The Economics of Imperfect Competition, (London: Macmillan Co., 1961), chaps. xx-xxii.

[5]K. W. Rothschild, The Theory of Wages, (Oxford: Basil Blackwell, 1956).

Factor supply has tended to be a weak aspect of this theory and only by assumption is a supply schedule established. Individual workers are presumed to adjust their supplies of effort according to the wage offered them. The workers' supply schedule is a composite of the many individual schedules and is affected by numbers of workers, numbers of hours, quality of workers and intensity of application. It was originally assumed that labor is in infinitely elastic supply to the employer but imperfect competition theory showed the value of an upward sloping supply curve. With monopsonistic purchase of labor, the possibility of rising wages and employment existed when a union offsets the employer's influence. Rather than an overt attempt to introduce institutional elements to the analytical model, however, this was just a systematic relaxation of assumptions.

The intersection of the supply and demand functions for labor determines the wage rate and the level of employment. Supply of labor to each firm in the industry is assumed to be perfectly elastic at the wage rate prevailing in the industry, therefore, the intersection of the firm's demand curve for labor and the labor supply schedule establishes the profit-maximizing level of employment and not the wage rate. If there is perfectly competitive purchase of labor, joint action by all employers establishes the cost of labor and if labor is in imperfectly elastic supply to the employer, the quantity of labor is hired such that the marginal increment in entrepreneurial gain equals the marginal cost of the resource. The wage, then, is a variable dependent upon the quantity of labor hired and not a directly determined quantity.

Competition among employers for the available labor ensures that all units of a fully employed, homogeneous labor supply receive the same rate of pay. If any unit of labor demanded a higher rate, it could be replaced by another unit. Given perfectly competitive factor purchase, labor receives a wage equal to the employer's marginal gain resulting from hiring an additional unit of the factor. It is in the employer's interest to hire additional labor until the increment in cost equals the increment in gain. It is this increment in gain to which the wage is equated. If labor is not in perfectly elastic supply to the employer, the wage is less than the marginal gain because the increment-in-cost function rises faster than the average cost function.

The marginal productivity theory is, essentially, a theory of employment. The treatises of Hicks[6], Douglas[7] and Cartter[8] are attempts to show the adequacy of the doctrine but they do not overcome the inability to analyze institutional forces as determining variables. Although results are what would be expected on the basis of productivity theory, the descriptive framework is not complete and theory is not strengthened by unrealism. In general, the mutations of

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[6]J. R. Hicks, The Theory of Wages, (New York: Macmillan Co., 1932).

[7]P. H. Douglas, The Theory of Wages, (1957 ed.; New York: Kelly and Millman, Inc., 1957).

[8]A. M. Cartter, Theory of Wages and Employment, (Homewood: R. D. Irwin, Inc., 1959).

productivity theory arise from relaxation of assumptions rather than direct attempts to incorporate institutional forces. The existence of union and monopsonistic activity necessitates an explanation of their function in wage determination, within the constraints of purely economic considerations.

The approach of this thesis consists of an examination of these purely economic considerations in Chapters II and III and a consideration of institutional forces in Chapter IV. Chapter II is an application of marginal analysis to market structures, setting out the strengths and weaknesses of the technique. Chapter III is a development of an analytical technique presented by Edgeworth[9] and Dunlop[10] but not exploited by them. This technique is found to be adequate in the cases examined by marginal analysis, including bilateral monopoly which is discussed in Chapter IV. It is in Chapter IV that institutional considerations are introduced. Chapter V sets out the limitations of this theoretical model.

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[9]J. Pen, The Wage Rate Under Collective Bargaining, (Cambridge: Harvard University Press, 1959), chap. iv.

[10]J. T. Dunlop, Wage Determination Under Trade Unions, (Oxford: Basil Blackwell, 1950), chap. v.

CHAPTER II

THE MARGINAL TECHNIQUE

This chapter examines the effect of competition, or lack of it, among entrepreneurs in the product and factor markets on the employment contract. The demand for factors is derived from their own productivity and from the demand for their output. The marginal productivity theory incorporates features of the theory of production and of the theory of value to establish the demand function for a productive service. From the marginal productivity theory, it can be said that the marginal gain accruing to the employer from the employment of a unit of a factor represents its value to the employer. The production function determines the physical contribution of a factor, given constant quantities of other factors, and the degree of competition in the product market influences the value of the physical output. It is also found that the nature of the factor supply facing the employer affects the price of the factor.

A COMPARISON OF FACTOR DEMAND.

The demands for factors by producers may be expected to vary as the competitiveness of the product market varies. A comparison of these different demands can be based on the industry demands for factors by assuming that an industry composed of many perfectly competitive firms comes under the control of a monopolist. A further necessary assumption is that each perfectly competitive firm operates one plant at the optimum level of output and that the monopolist

adjusts output so that the firm's marginal cost equals marginal revenue to the firm. The monopolist's plants that continue to operate face the same technical conditions of production as the perfectly competitive firms. The difference in factor demand will, then, arise from the fact that the monopolist chooses to restrict output and raise product price while competitive producers adjust output to the profit-maximizing position consistent with the prevailing product price.

Assume initially that the factor demand of the industry is only a small portion of the market demand for the factor. The supply of the factor to the industry is perfectly elastic. The sum of the quantities of the factor demanded by the competitive firms in the industry represents the quantity demanded by the industry but, because the product price for different levels of output by the industry is not constant, a simple addition of firm demand schedules does not accurately yield the industry's demand schedule for the factor. The demand schedule of a firm for a variable factor is given by the marginal physical product. Competitive firms adjust their levels of output without affecting price but if, for some reason, all firms in the industry react simultaneously product price will change, as will the value of the marginal product to individual firms. Effects external to the firm but internal to the industry require adjustment of the firm's factor demand curves to allow for falling product price with expansion of the industry output. Summation of these adjusted firm demand curves constitutes the industry's demand for the factor.

Assuming identical competitive firms, conditions of production give rise to the marginal and average physical product curves of Figure I for all firms. The firm's demand curve is the portion of the

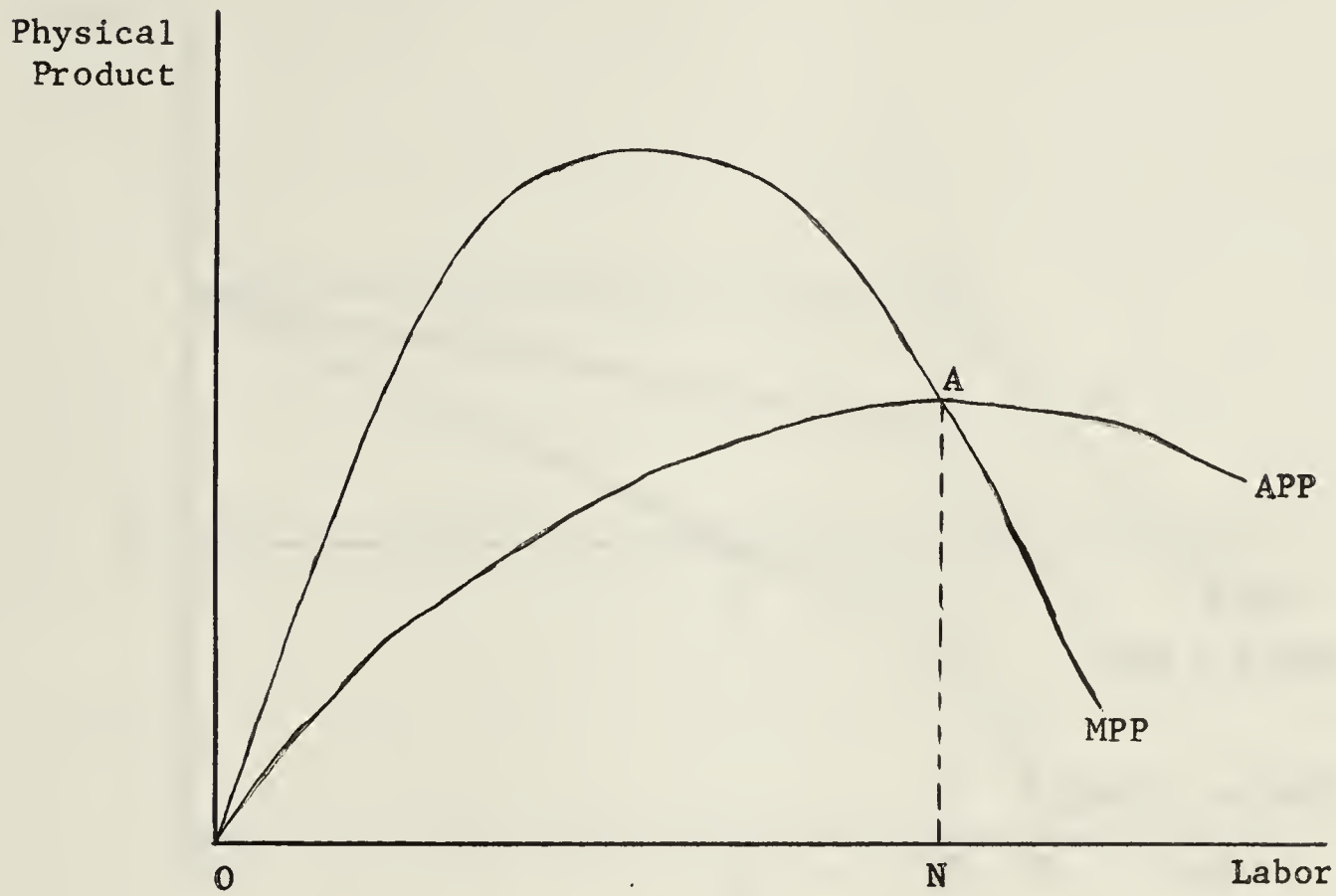

Fig. I. -- Firm's demand for labor in product terms.

MPP curve to the right of "A". In revenue terms, this factor demand curve of a competitive firm would be MPP multiplied by constant product price. The competitive industry's factor demand curve can be derived from a summation of the relevant portions of the firm's MPP curves. Because all firms are identical, the industry demand function, in product terms, is not higher than NA at any point and, prior to the point where aggregate marginal physical output begins to diminish, is perfectly horizontal, as in Figure II. To determine the industry's factor demand in revenue terms, the aggregate MPP is multiplied by

falling product price because the demand for the industry's output is not infinitely elastic. If the market supply of labor is infinitely elastic at wage rate OW, ON_1 units of labor are hired by the industry.

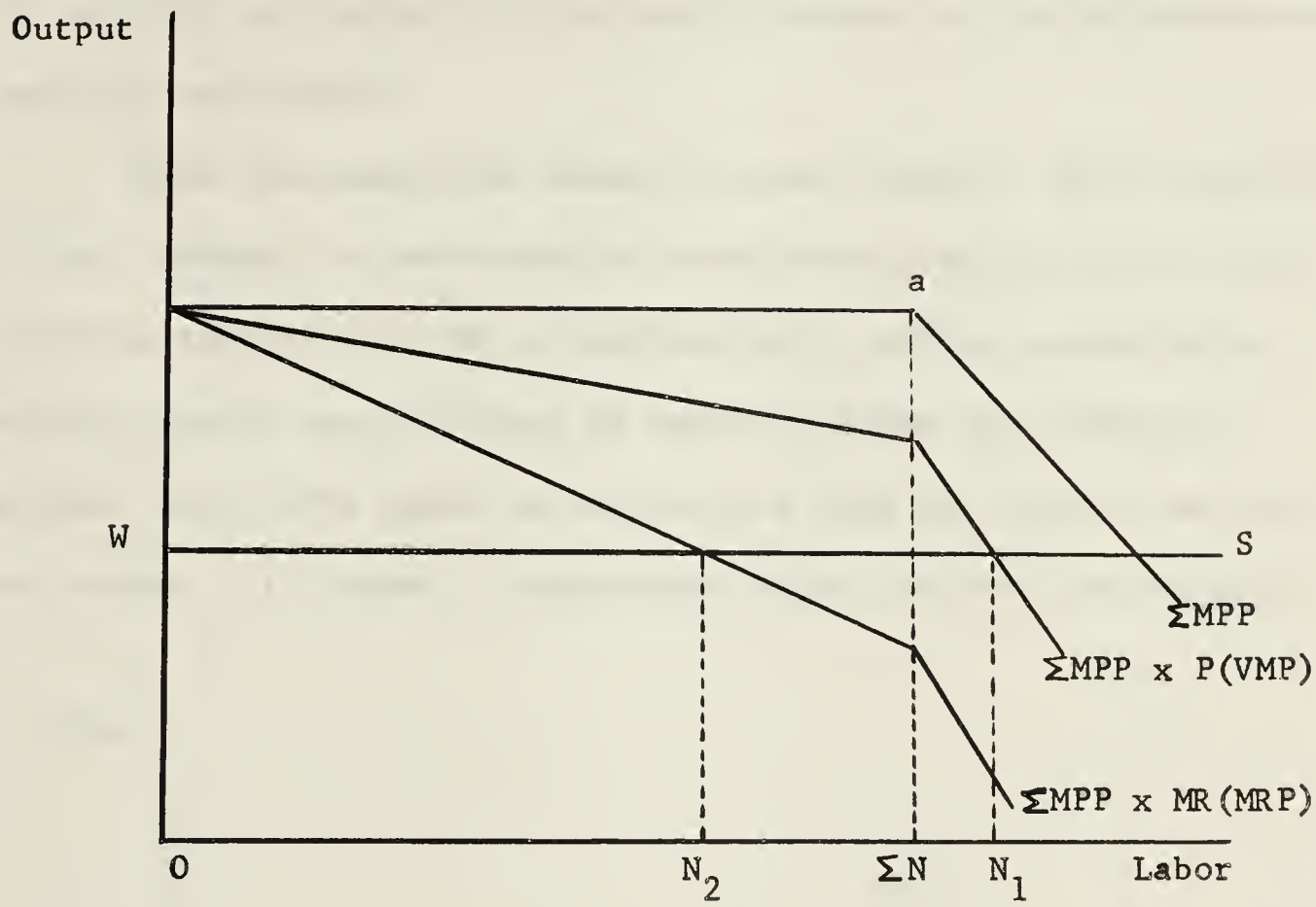

Fig. II. -- Industry's demand for labor.

The individual firms adjust output to the conditions facing them and the industry is a composition of the large number of producing units.

In the case of monopoly control of the industry, where changes in industry output reflect on the firm's marginal revenue, because the firm is in industry, the factor's MPP to the industry is valued in terms of marginal revenue. This gives the MRP curve of Figure II. The monopolist's factor demand curve is lower because marginal revenue is the prime consideration. ON_2 units of labor are hired by the industry, the quantity for which MRP equals the constant marginal labor cost.

Clearly, the level of employment, when a monopolist controls the industry, is smaller than when perfect competition exists among the plants of the industry. It can be concluded that a difference in conditions facing the employer is responsible for the difference in factor demands and levels of employment[1].

When the monopolist takes over the industry, MR to the firm is falling. Output is restricted in order that marginal cost of the output is equated with MR or alternatively, MRP is equated with marginal factor cost. Output is adjusted along the industry's marginal cost curve which is constructed from the plant's marginal cost curves. If output is restricted below the level at which all

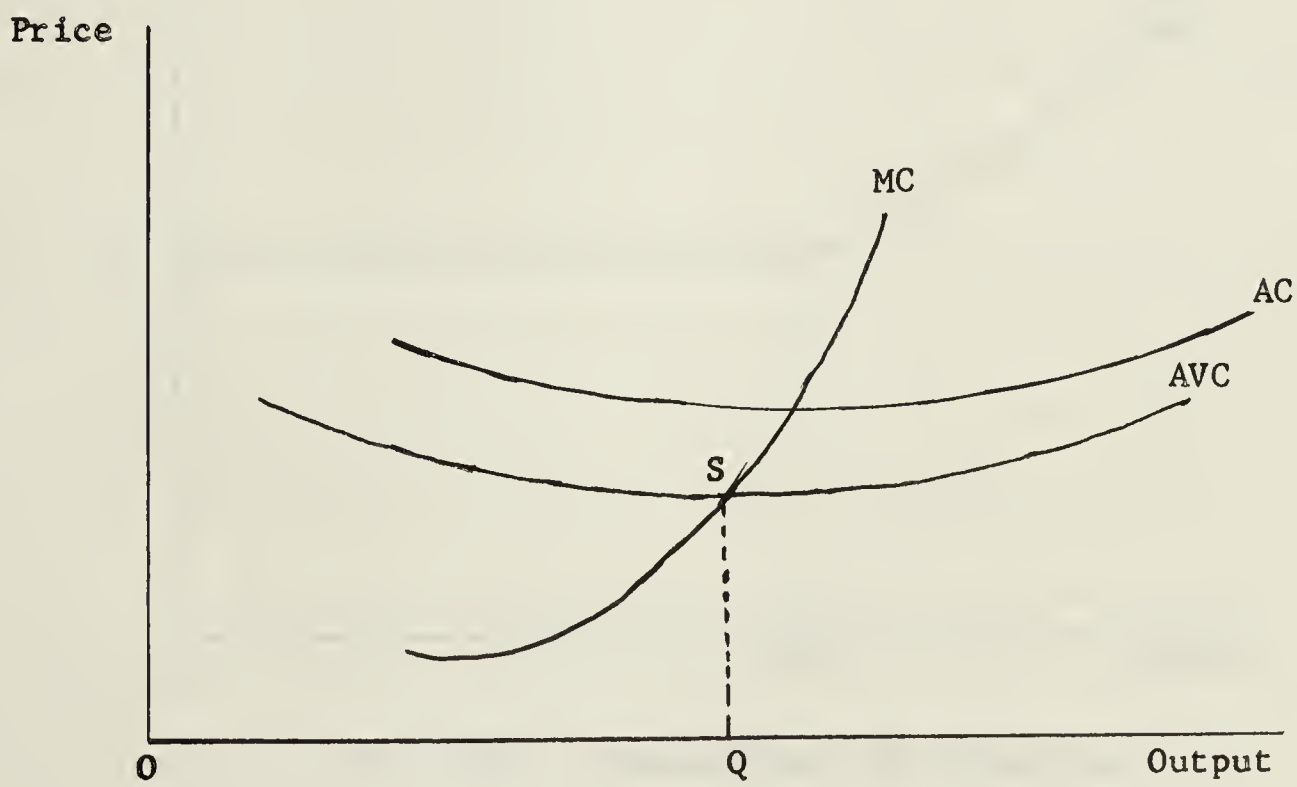

Fig. III -- Monopolist's plant cost structure.

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[1]A similar conclusion is arrived at in a long run context by J. Robinson, The Economics of Imperfect Competition, (London: Macmillan Co., 1961), chaps. xxi-xxiii.

plants operate at minimum AVC, some plants will be closed rather than all plants being operated on the falling portion of AVC. Figure III illustrates this proposition.

Although all plants have the same cost structure, the monopolist will close some rather than operate all at an output smaller than OQ: the operating plants then produce at an output at least as large as OQ. Because no plant will be operated with marginal costs smaller than OS, the monopolistic firm's marginal cost schedule has a horizontal range OS above the x-axis before it turns upward at ΣQ as in Figure IV.

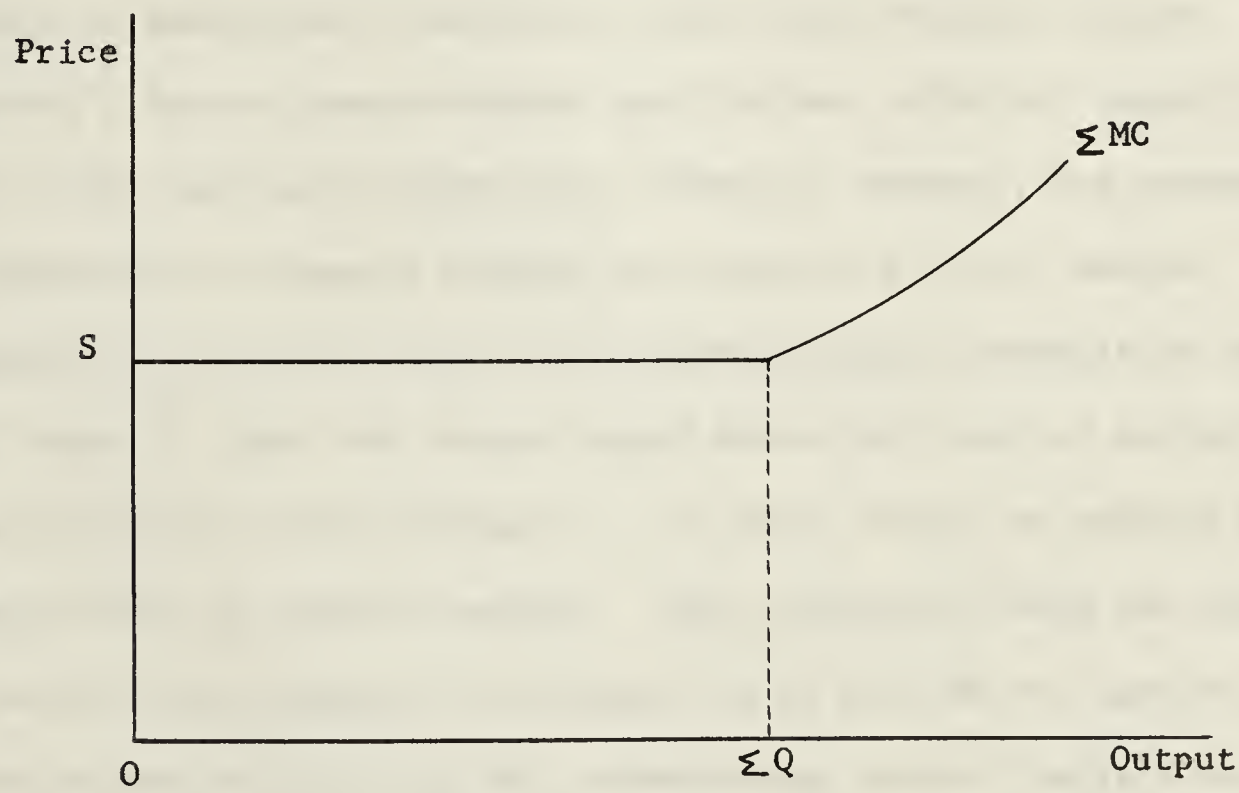

Fig. IV. -- Monopolist's MC schedule.

The propensity to restrict output derives from falling marginal revenue to the firm. Under monopolistic competition and oligopoly, the element of monopoly control depends upon the elasticity

of demand for the firm's output. From the equation $MR = P - \frac{P}{e}$,[2] $\frac{MR}{P} = 1 - \frac{1}{e}$. Under perfect competition where elasticity of demand (e) approaches infinity, $\frac{1}{e}$ approaches zero and the firm's marginal revenue-price ratio ($\frac{MR}{P}$) approximates 1. Under monopoly where demand for the firm's output is less elastic; but e is greater than 1, $\frac{MR}{P}$ is less than 1, that is, marginal revenue is less than price. It follows that MRP is less than VMP as product demand becomes less elastic.

Generalizing from this, it is possible to rank monopolistically competitive and oligopolistic factor demands between the limits set by perfect competition and monopoly. Monopolistic competition implies product differentiation, which could expand the product market, and an element of monopolistic behavior, which would restrict output. The industry's factor demand depends upon the net effect of competition among firms and their monopolistic behavior; however, the presence of monopolistic elements reduces the industry's factor demand. The tendency to restrict output in a monopolistically competitive industry would seem to lower the factor demand below the level of perfect competition but this difference is, in part, offset by product market expansion due to product variety. Under oligopoly, with few firms, the monopolistic element is stronger but it must be set against the market expansion resulting from advertising, product variety and product improvement from research. To the degree that the oligopolistic firms operate in agreement, their collective demand for labor approaches that of a monopolist and the extent to which they

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[2]This relationship is proven geometrically by R. H. Leftwich, The Price System And Resource Allocation, (New York: Holt, Rinehart and Winston, rev. ed., 1961), p. 231.

compete amongst themselves expands their collective labor demand. It is assumed in the following comparison that product variety, or other reasons for market expansion, is not sufficiently strong to outweigh the monopolistic tendency of restricting output.

SOLUTIONS.

Figure V illustrates the general relationship between these industry demand curves for labor. It is assumed that the supply of labor to the industry is perfectly elastic at wage OW and it is seen that the level of employment in the industry falls as monopolistic tendencies increase. Product differentiation and advertising may

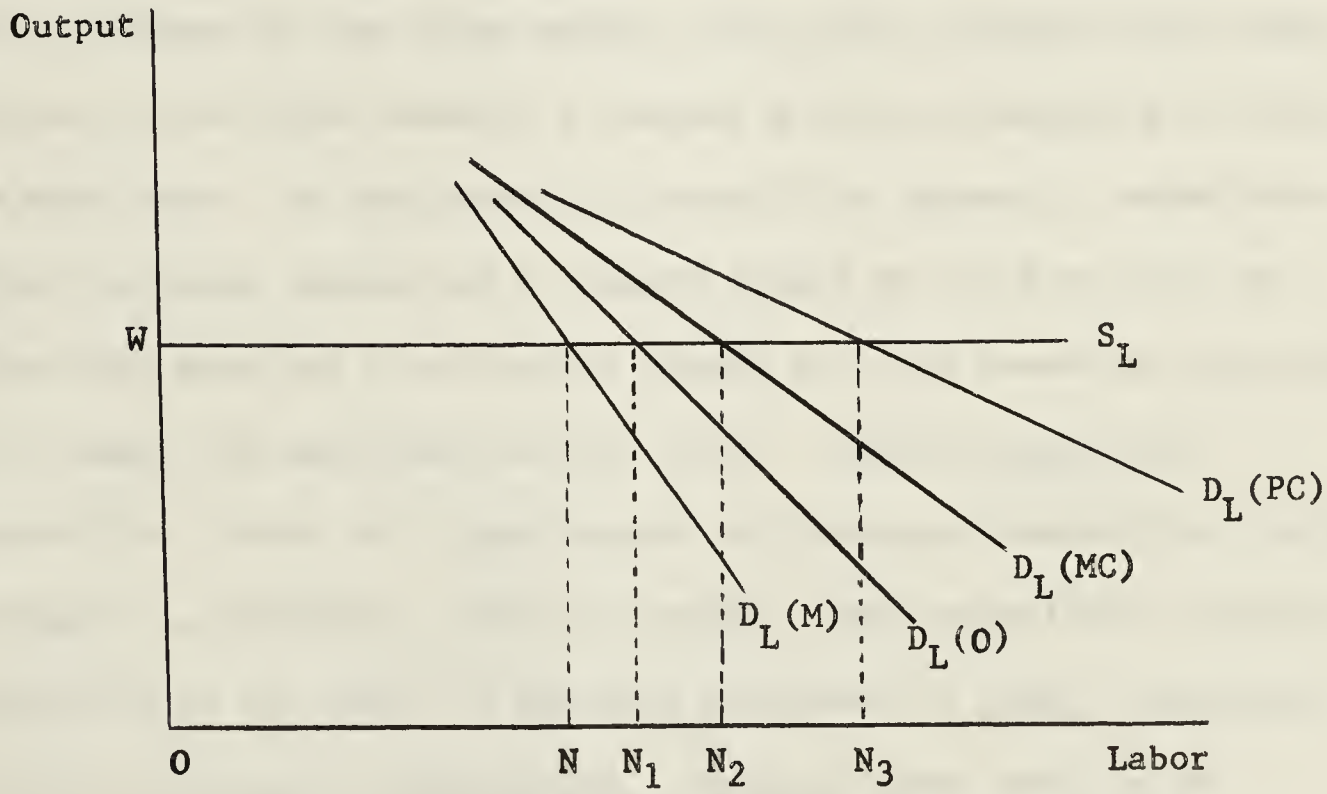

Fig. V. -- Comparison of industry labor demand curves resulting from various types of product markets.

expand the product market which could result in a larger factor demand than under perfect competition. If, however, the competitive industry

is taken over by an oligopoly or monopolistic competitors, it seems that considerable time would be required for their actions to produce this result. Before product changes or effective advertising programs could be designed, the labor demands of the monopolistically competitive $D_L(MC)$ and oligopolistic $D_L(O)$ industries would be ranked between $D_L(PC)$ and $D_L(M)$. $D_L(O)$ is only a lower limit in this comparison because a less than rigid oligopoly cartel is assumed.

If the industry's demand for labor constitutes the market demand, different levels of wages will result as the degree of competition in the product market changes. With the industry being the sole purchaser of the labor supply, the supply schedule will slope upwards to the right because a changed quantity demanded will affect the wage rate. In the perfectly competitive industry, competitive factor purchase exists and a changed demand by any firm will not affect the wage but a collective change in labor demand by the industry will change the wage rate paid to labor. Under monopolistic competition, there is a large number of firms and competitive factor purchase is, therefore, likely to exist. The monopolistic industry, controlled by one firm, is the only purchaser of labor; therefore, the firm is a monopolist-monopsonist. Marginal labor cost to the employer, in this case, is greater than average labor cost, and because MRP is equated with MFC, the wage is less than the factor's MRP to the firm. Under oligopoly, with few purchasers of labor, the factor demands of any firm affect the wage rate and the marginal factor cost

will be greater than average factor cost. If there is one dominant firm, it is likely that all other firms must pay the wage rate paid by the "wage-leader" to satisfy their factor requirements. These firms would adjust their employment to the level at which MRP equals MFC, with MFC being dependent upon the dominant firm's influence. If the oligopolists are of approximately equal size, they may tacitly agree to pay the same wage rate, in which case the industry hiring policy would resemble that of a monopsonist. Wage rigidity is likely to occur in this case because a change in the wage rate of any one employer would be met by retaliation or a parallel change by all other employers.

A comparison of the industry wages paid is given by Figure VI.

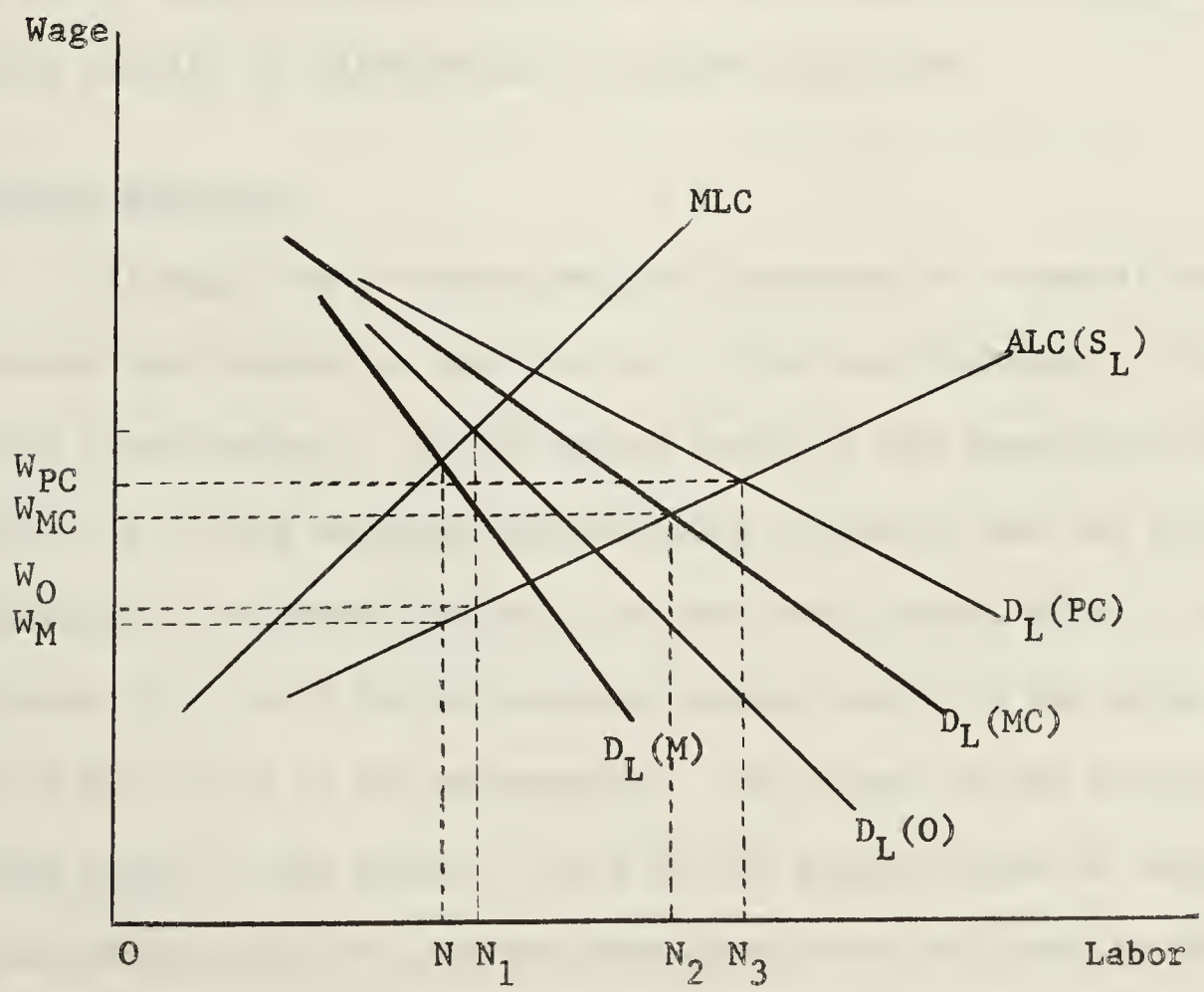

Fig. VI. -- Effect of imperfectly elastic labor supply to the industry.

W_0 and N_1 are lower limits because a less than rigid oligopoly cartel is assumed. Competitive factor purchase in the perfectly and monopolistically competitive industry implies that labor supply is perfectly elastic to the individual unit and each pays the prevailing wage. Oligopsony and monopsony implies that marginal labor cost to the employer is greater than average labor cost, and to satisfy the profit maximizing condition, wages are smaller than the factor's MRP. Since the industry faces the same labor supply curve, the degree of competitiveness among the purchasers of labor is responsible for the difference in wage rates.

In setting out the effect of various market forms, it was necessary to make the comparisons on an industry basis. This necessitated some demanding assumptions but it was possible to attribute certain results to differences in market structure.

Bilateral Monopoly.

Although the orthodox marginal approach is a useful analytical technique and capable of application to various problems, it has certain shortcomings. The foregoing analysis has demonstrated the flexibility of the marginal productivity approach, and the following discussion of bilateral monopoly in the labor market shows a weakness. In Figure VII, let D be the average revenue curve to the union and labor's MRP curve to the monopsonist. MD, then, is the marginal revenue curve to the union. Let C be the supply curve of labor to the monopsonist and MC, the marginal cost curve of labor to the

employer. The monopsonist, in equilibrium, equates MC and D, hires ON units of labor and pays each unit OW. The monopolist equates C and MD, sells ON_1 units of labor and offers each unit for OW_1. The

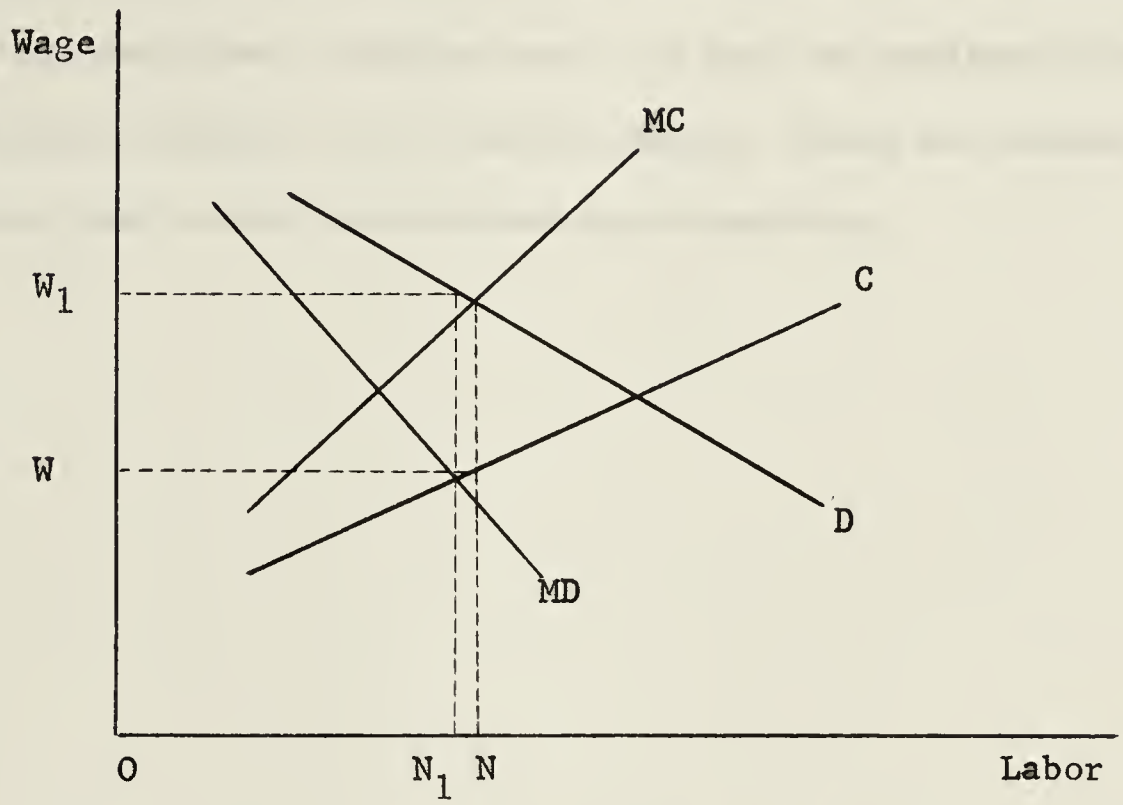

Fig. VII. -- Bilateral monopoly.

price per unit and quantity is, therefore, indeterminate as a result of the difference in objectives. This model, which is a variation of product monopoly, is not legitimate, however, because a monopolized labor supply does not have well defined marginal and average cost curves; therefore, marginal analysis of this subject is unsatisfactory on two counts.

CONCLUSION.

The comparison of factor demand by an industry coming under the control of producers ranging from perfect competitors to a monopolist is,

at best, hypothetical. Demanding assumptions were necessary to allow oligopoly and monopolistic competition to be ranked and Figure VI suggests a solution for the oligopolistic and monopolistically competitive factor demands. These are more likely to be lower limits for the wage-employment combinations. It must be concluded that, while marginal analysis is a flexible device, there are certain limitations that cannot be overcome by assumptions.

CHAPTER III

THE OFFER CURVE TECHNIQUE

An alternative technique is developed in this chapter for the examination of the economic factors bearing on an employment contract. Much of the material of the previous section is discussed once again but this duplication is not without purpose. First, showing the effect of market structure on the individual decision-maker and second, comparing marginal analysis and indifference curve analysis is accomplished by the repetition. To facilitate the comparison of the two techniques, the terminology of the marginal productivity doctrine is extensively used. A major portion of the chapter is concerned with developing the analytical model and the second part is an application of the model to product and factor markets with varying degrees of competition.

The assumptions of the model are very similar to those required by marginal analysis. For instance, assume that:

1. employers behave rationally and maximize profits,
2. employees behave rationally and maximize satisfaction,
3. variable resources are completely mobile,
4. every individual possesses perfect knowledge,
5. resources are fully employed,
6. labor and employer associations are absent from the labor market,
7. units of each resource are homogeneous.

Whenever necessary certain of these assumptions will be relaxed and occasionally, additions to this list made.

DEMAND FOR LABOR.

Derivation of the demand function for labor is the initial task of the indifference curve technique. The firm's demand for labor can be deduced from the total revenue product curve. Assume that labor is applied in variable amounts to fixed quantities of capital, land and entrepreneurship. For each quantity of labor input, then, a certain total revenue product results. Since the employer is interested only in profit maximization, he will hire the quantity of labor that yields the largest surplus above fixed costs of production. Since the cost of factors other than labor is fixed, the cost of each amount of labor is the quantity determining the amount of labor hired.

In terms of the indifference curve analysis, the employer must be indifferent among certain combinations of quantities of labor and their corresponding costs. To be indifferent among levels of output, the cost of the necessary labor must be subject to change in order that a constant surplus is earned. The employer's indifference map is found, then, by determining the total labor cost of each amount of labor hired that is consistent with a certain constant surplus. In the sense that the employer's satisfaction is derived from the profit he earns, each indifference curve reflects the size of profit consistent with the variable labor cost.

Single Variable Factor.

Figure VIII demonstrates the geometric derivation of the employer's indifference map from the total revenue product curve. At each level of employment, a constant amount of revenue, "a", is subtracted from the total revenue product produced by each amount of labor. The locus of points thus derived traces E_1. The vertical distance between the TRP and the indifference curve indicates the revenue available for profit and for paying the fixed factors. The vertical distance below the indifference curve represents the cost

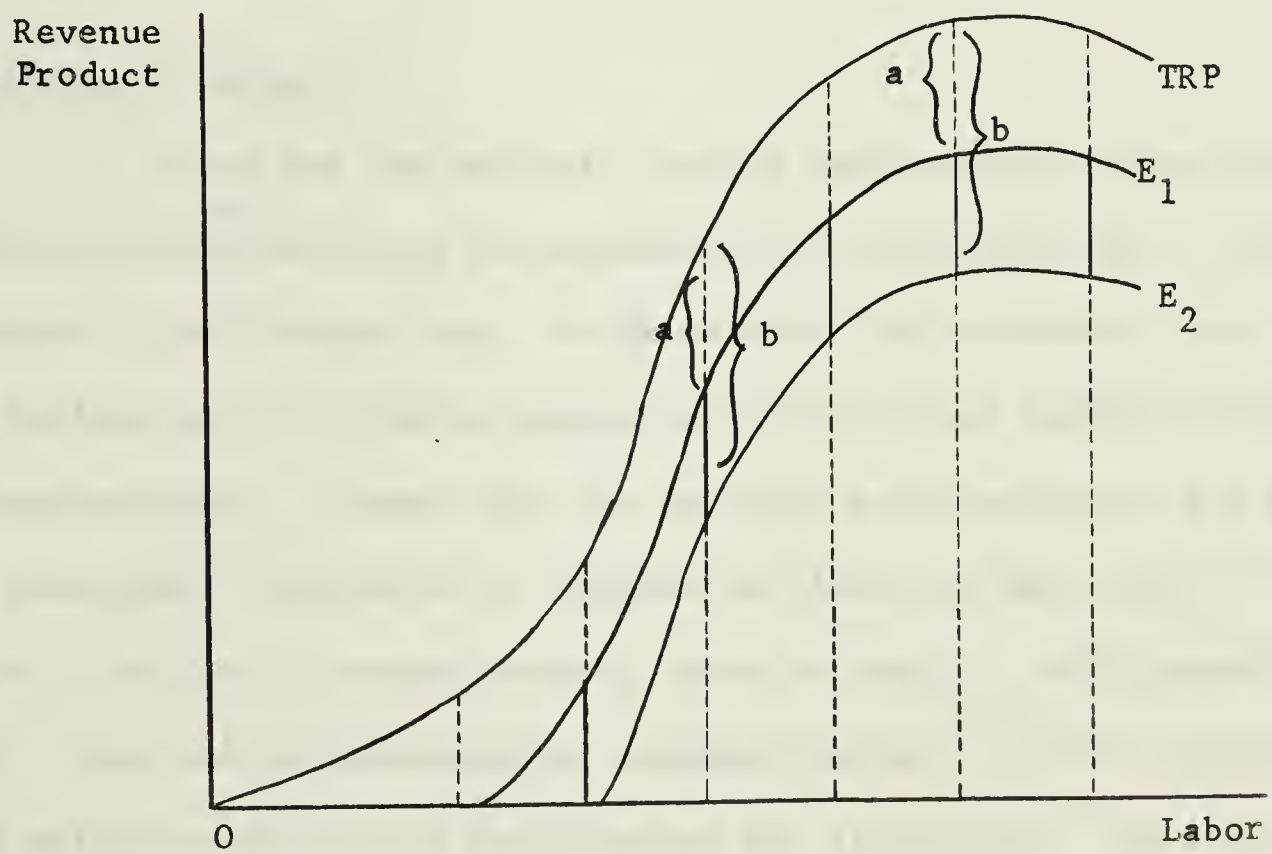

Fig. VIII. -- Derivation of employer's indifference map.

of corresponding amounts of labor. Clearly the TRP curve is an indifference curve also because it relates to quantities of labor, and indicates a level of profit.

The ratio between the total wage bill and corresponding levels of employment is traced out along each curve, with the employer being able to increase the wage bill, by diminishing amounts, for constant increases in the quantity of labor, and maintain the same level of satisfaction. The diminishing slope of the indifference curves indicates a diminishing marginal revenue product of labor, stated mathematically by the ratio $\frac{TRP_2 - TRP_1}{Employment_2 - Employment_1}$. As the slope of an indifference curve approaches zero, labor's MRP similarly approaches zero.

Two Variable Factors.

If there are two variable factors combined with fixed factors, additional considerations are necessary for the derivation of the employer's indifference map. To demonstrate the technique, let labor and capital be the variable inputs applied to fixed amounts of land and entrepreneurship. Assume that the employer acts rationally and employs the least-cost combination of capital and labor at each level of output. The total revenue product curve of capital, with quantities of labor, land and entrepreneurship assumed constant, is the construct from which the employer's indifference map is derived. The means by which this is accomplished can be observed in Figures IX and X. Several TRP curves of capital are presented, the differences among them being attributed to the different quantities of labor combined with the variable amount of capital. The quantity of labor is increased for higher TRP curves; the vertical distance between curves being indicative of the effect of the added labor. Temporarily, a simplifying

assumption of perfectly elastic capital supply to the employer is made but will be relaxed presently.

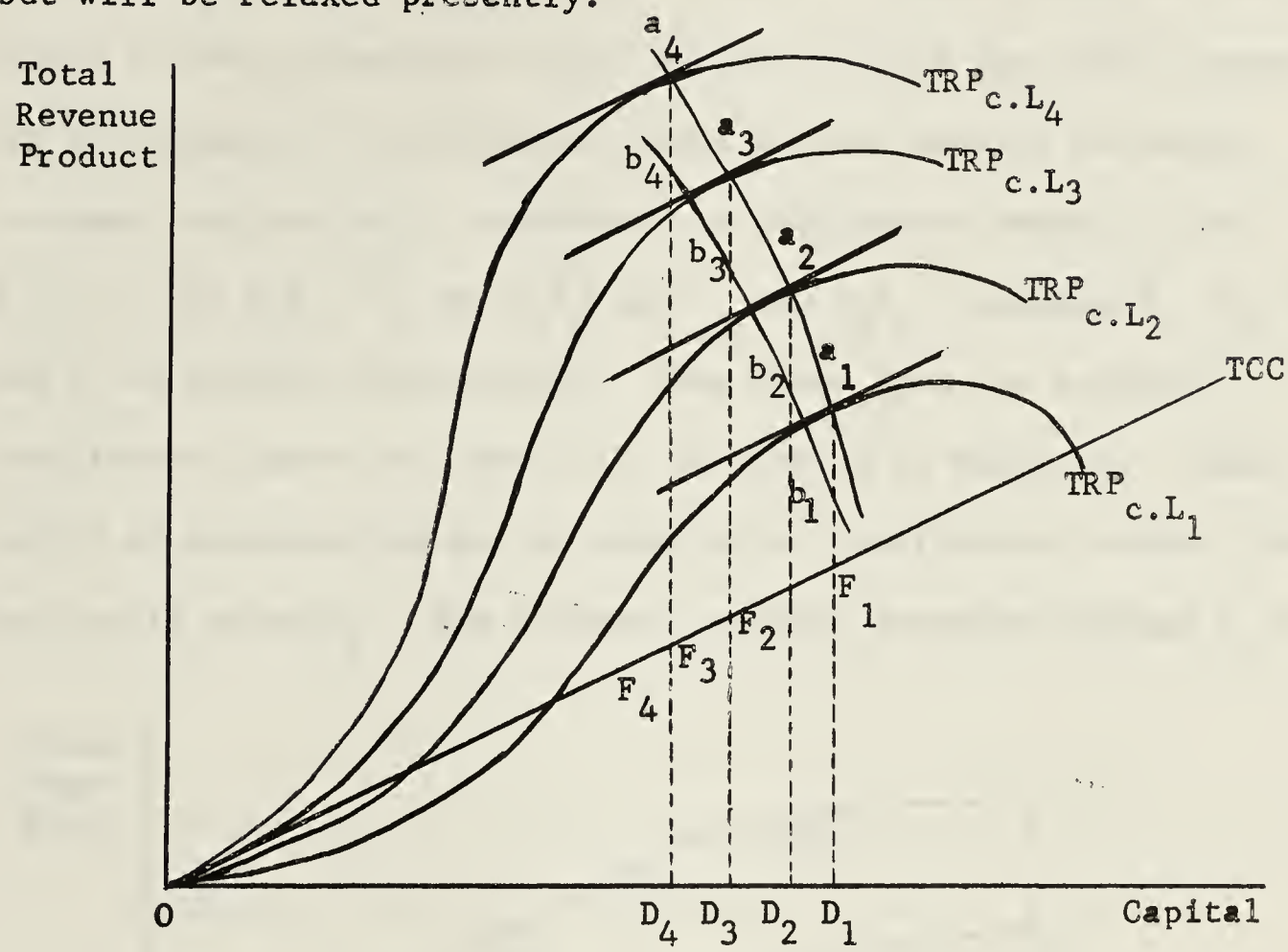

Fig. IX. -- Derivation of employer's indifference map with two variable factors.

The maximum-profit level of capital employment is that amount for which the marginal cost equals the marginal revenue product. In Figure IX, this quantity is determined when the tangent to a TRP curve is parallel to the TCC line, that is, at D_1, D_2, D_3 and D_4 for tangency points a_1, a_2, a_3 and a_4 respectively. The vertical distances between each TRP curve and the TCC curve are maximized when this condition is fulfilled because marginal factor cost equals marginal revenue product at this stage. The vertical distances a_1F_1, a_2F_2, a_3F_3, a_4F_4 are the amounts of total revenue product left undistributed after capital is paid its assumed amount. From the undistributed portion must come the reward

for the fixed factors, including labor. If the revenue product in excess of each total capital cost is paid to labor, negative profits accrue to the entrepreneur equal to the costs of the fixed factors. The entrepreneur is indifferent among various ways of achieving the same loss and will, therefore, be indifferent among L_1 for a_1F_1, L_2 for a_2F_2, L_3 for a_3F_3 and L_4 for a_4F_4; choosing D_1, D_2, D_3 and D_4 of capital respectively. From these data the employer's indifference curve for labor, E_1, is plotted in Figure X. Higher levels of satisfaction may be depicted by indifference curves lying vertically below E_1. The constant vertical distance between E_1 and

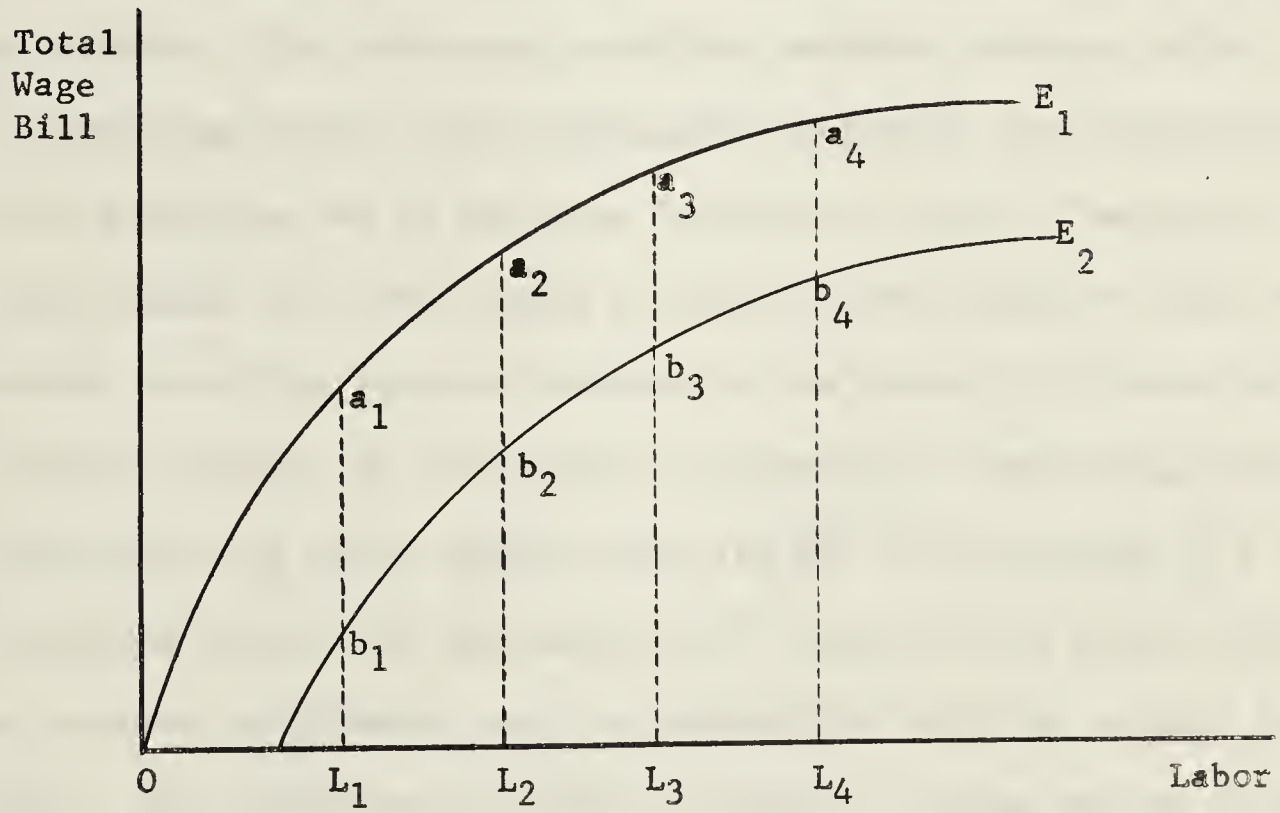

Fig. X. -- Employer's indifference Curves.

E_2 in Figure X is equal to the constant distance a_1b_1, a_2b_2, a_3b_3 in Figure IX, being the amount available for fixed costs and profits. By varying the distance a_1b_1 an indifference map can be constructed, the

curves being vertically parallel.

Figure IX was drawn under the assumption that diminishing returns, in revenue terms, to labor and capital prevail. With constant product price, the returns to capital diminish in accordance with the Law of Variable Proportions because the quantity of labor is changed only for different TRP curves and not over each TRP curve. Diminishing returns, in revenue terms, to labor are a necessary condition of the model, but it is incorrect to label the decreasing rate of increase in TRP for quantities of labor L_1, L_2, L_3 and L_4 orthodox diminishing returns since the quantity of capital employed is variable. For this case, with two variable factors, which precludes use of the term "diminishing returns", and two fixed factors, which precludes use of the term "returns to scale", "marginal significance" has been chosen to describe the change of total revenue product resulting from an increase in the quantity of labor and an incidental change in the quantity of capital. Diminishing marginal significance of labor implies that its TRP is increasing at a decreasing rate, with the quantity of capital being always adjusted to the most profitable level in conjunction with the assumed labor input. The indifference curves of Figure X, being concave from below, indicate diminishing marginal significance.

If indifference curves were convex from below, labor's marginal significance would be increasing and the employer would be willing to pay increasingly larger amounts for constant increases in employment. If marginal significance were increasing, the employer

would continue to increase output and the optimum size of output would be infinite. Constant marginal significance would lead to an infinite, indeterminate or zero output, depending on the wage rate, the employer indifference curves being straight lines. The two cases that do not give rise to indifference curves concave from below preclude finite determinate solutions; therefore, it can be said that diminishing marginal significance of labor is a necessary condition of determinate employment contracts. In the one variable factor case, diminishing marginal productivity is required for determinate solutions.

This does not preclude increasing or constant marginal significance over a certain range of employment, however, as in Figure XI. The portions of the indifference curves that are convex from below indicate an increasing marginal significance of labor. For

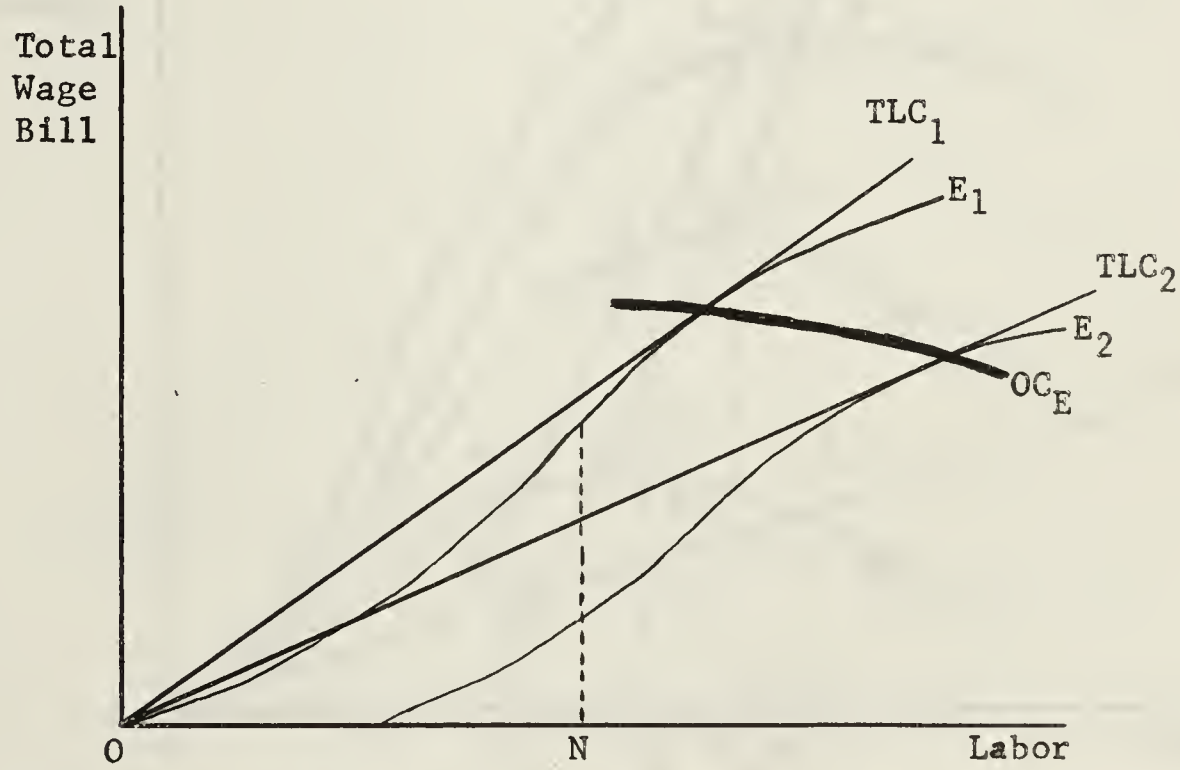

Fig. XI. -- Increasing and diminishing marginal significance of labor.

levels of employment O to N, the employer is willing to pay increasingly larger amounts for constant increases in employment, therefore, the

marginal significance of these units of labor must be rising. While labor's marginal significance is rising, the employer adds to his labor force and a stable employment equilibrium occurs when the indifference curves are concave from below. If, however, the TLC lines are curved, showing a changing marginal labor cost, tangency at any point on the indifference curves would be possible and would signify equilibrium, that is, equality between labor's marginal cost and marginal significance.

Figure IX was drawn on the assumption that as more labor is employed, less capital is hired, but this is not a necessary condition. It is equally possible that labor and capital may be complementary, as

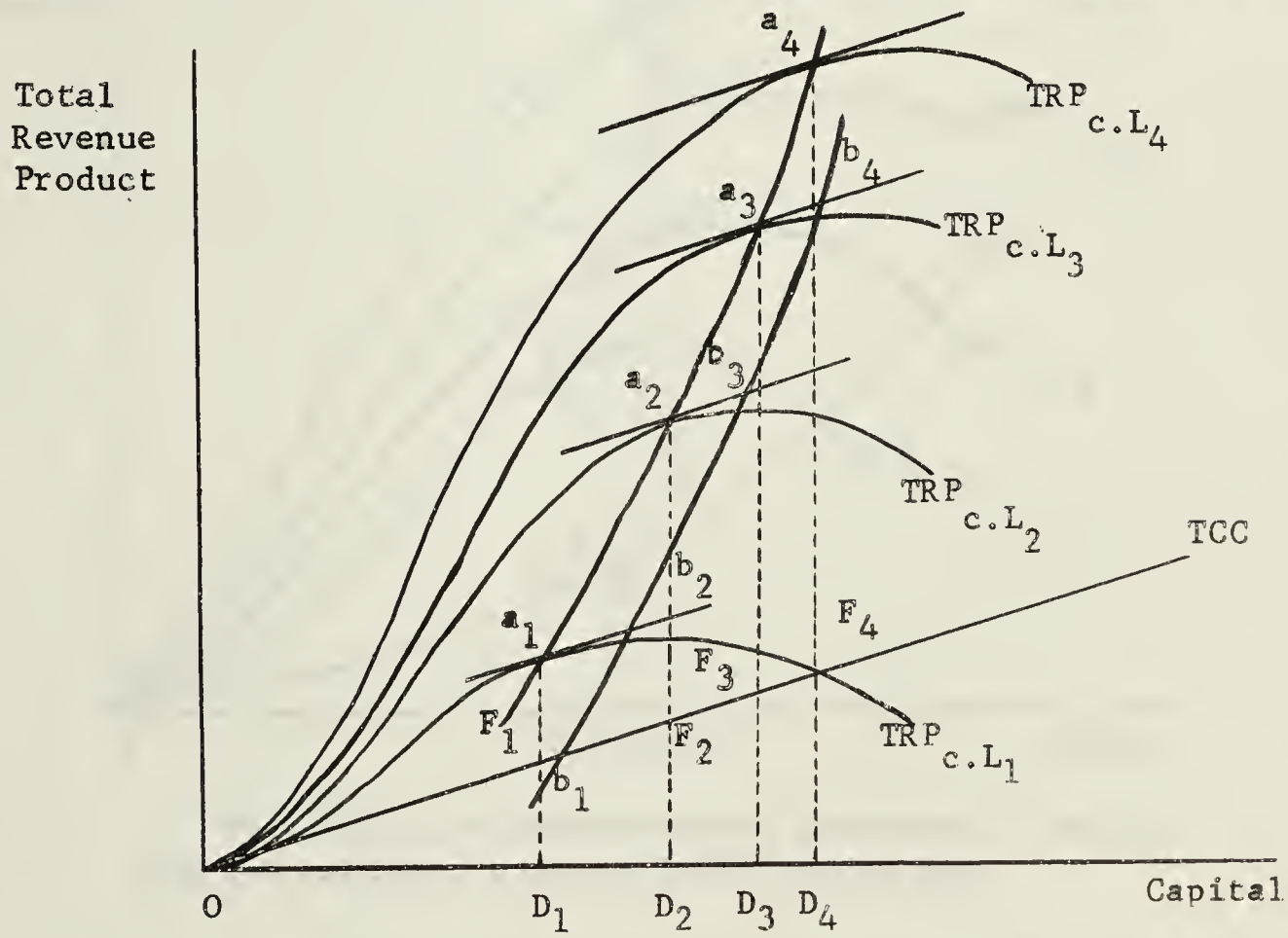

Fig. XII. -- Derivation of employer's indifference map with complementary factors.

in Figure XII. Assuming diminishing marginal significance of labor, the total wage bills a_1F_1, a_2F_2, a_3F_3 and a_4F_4 increase at a decreasing rate

while the quantity of labor is increased at a constant rate. The same relationship is applicable to the wage bills b F , b F , b F and b F : in this instance a higher level of satisfaction is enjoyed by the employer. The technical requirements of production do not, then, affect the conclusion that the employer's indifference curves tend to be convex from below.

The effect of monopsonistic purchase of capital must now be examined. Figure XIII illustrates its consequences upon the employer's preference map. As the marginal cost and price of capital rises, the

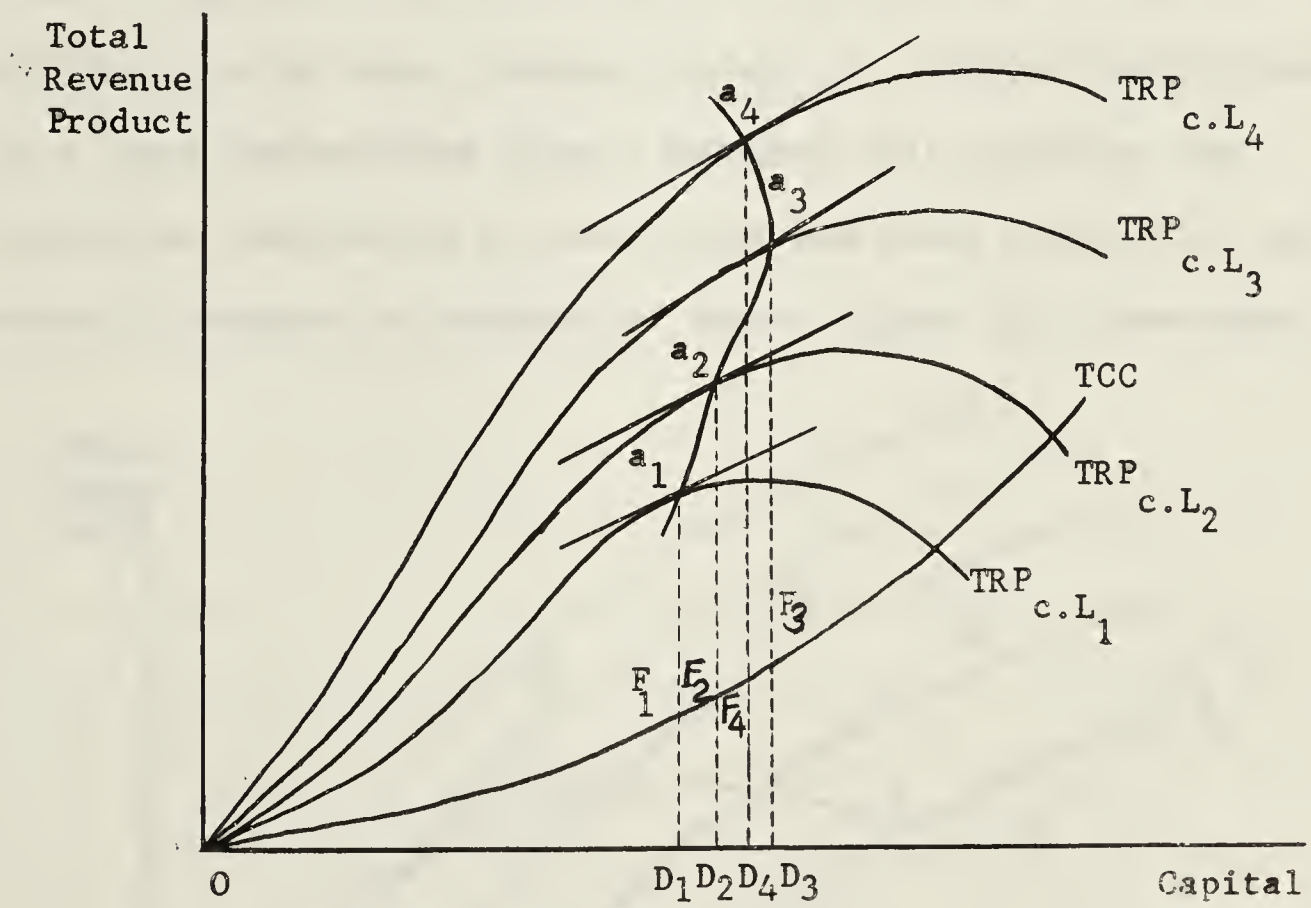

Fig. XIII. -- Monopsonistic purchase of capital and the employer's labor indifference map.

least cost combination of capital and labor is affected. The maximum profit quantity of capital, with the labor quantity constant, is different from that when the price of capital is constant. This affects

the marginal significance of labor and, therefore, the slope of employer indifference curves for labor. The productivity of labor is, in part, dependent upon the quantity of capital employed; therefore, conditions causing the quantity of capital used to be different ultimately affect the significance of labor to the employer.

The Offer Curve.

It is seen that the employer's equilibrium condition is equality between labor's marginal cost and marginal revenue product or marginal significance depending upon whether one or two factors are variable. In any case, tangency between an employer indifference curve and a curve representing labor's marginal cost signifies the equilibrium combination of labor units and total wage bill. Assuming perfectly competitive purchase of labor, Figure XIV illustrates the

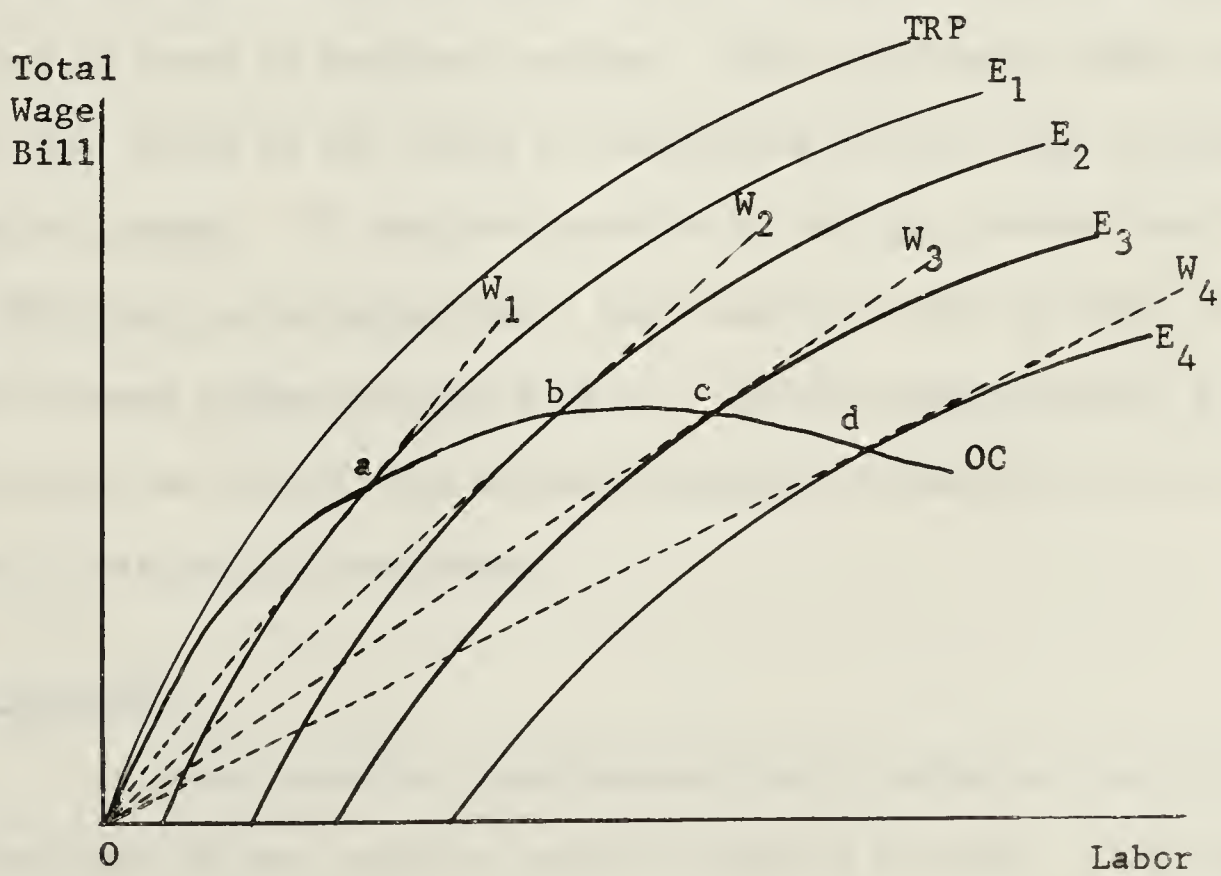

Fig. XIV. -- Employer's offer curve.

determination of these equilibrium combinations. The vectors, being straight lines, indicate a constant marginal labor cost and for each quantity of labor, they show the total labor cost. At the points of tangency, where the slopes are equal, labor's MC equals its MRP. The locus of these points of tangency is the employer's offer curve and it shows the total wage an employer would pay each quantity of labor and be in equilibrium. It is, therefore, the demand curve for labor.

Effect of Product Market on Indifference Map.

The effect of product market competition on indifference curves must be described. When the product market is perfectly competitive, the marginal output of a factor can be valued by the prevailing price. If the market is not perfectly competitive, however, product price falls as output increases and it becomes necessary to value the marginal output in terms of marginal revenue. This adjustment takes account of the lower price on all units of output and not just the increment in physical output. If marginal revenue is falling, rather than constant, the TRP curve of a factor has a more shallow slope, as have the indifference curves derived from it. As the product market gives rise to steeper MR curves, the revenue function increases the rate at which labor's MRP and MS diminishes.

The Long Run.

It seems that the indifference curve technique could be used in an analysis of the long run with all factors variable. The two variable factor model shows there to be diminishing marginal significance of one

of them while two factors are constant. If all factors were variable, with decreasing returns to scale, the marginal significance of all factors would be diminishing because their contribution to the employer's gain would be falling. Under conditions of constant returns to scale, with a finite product market, the revenue function would cause the marginal significance of factors to fall. If there were increasing returns to scale, in physical terms, it would be necessary for the revenue function to decrease at a rate faster than the rate of increase in output for there to be diminishing marginal significance of labor. The geometrical presentation used in this thesis cannot be readily adapted to represent four variable factors and since the long run model is not an essential part of the thesis, an alternative presentation will not be developed. It seems that a system of equations based on the principles of the two variable factor model may be a fruitful method of presenting the long run model.

SUPPLY OF LABOR.

Individual's Labor Supply.

It remains now to develop the supply function of labor in terms of the indifference curve-offer curve analysis. The individual's supply of effort is the basis for this derivation. Income and leisure of the worker are taken to be the determining concepts of the individual's labor supply function. Figure XV shows the relationship between the worker's indifference map of leisure and income and the employment preference map. The quantities of equally satisfying income and leisure are given by the indifference curves of diagram A. A

physical constraint of twenty-four hours of leisure per day exists although the worker may offer some effort without pay. Twenty-four hours of effort is also an unrealistic constraint and the indifference curves of diagram B should become vertical before this limit is reached. Rather

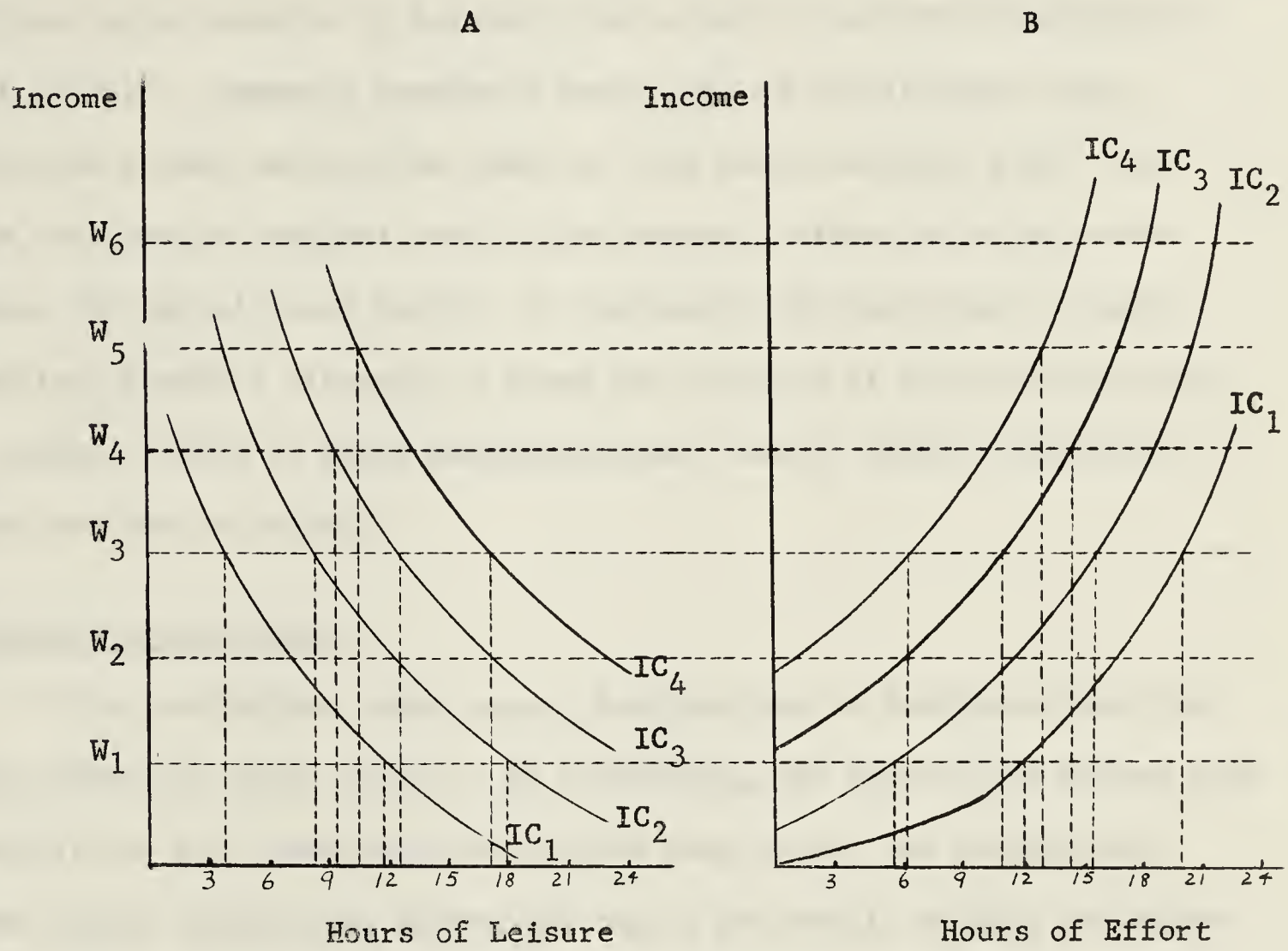

Fig. XV. -- Individual worker's indifference and employment preference map.

than estimate the actual limit, the foregoing caution is offered. The indifference curves of diagram B, derived directly from diagram A, are convex from below because of the increasing disutility of effort. For the individual to increase his effort per day and remain indifferent, total earnings must be increased at a rate faster than the increase in effort.

Individual's Offer Curve.

The individual worker's offer curve is the locus of points of tangency between vectors and the worker's indifference curves. The slope of indifference curves is given by the ratio $\frac{\Delta \text{Income}}{\Delta \text{Effort}}$ which is the marginal gain required to persuade the worker to perform an additional unit of work. Tangency between a vector and an indifference curve indicates worker equilibrium since at this point marginal gain, the wage rate, equals marginal cost to the worker. Since the offer curve passes through all such points, it represents the individual's supply function of effort although it shows the quantity of effort forthcoming at certain levels of total earnings rather than at certain levels of wages per unit of effort.

Aggregate Labor Supply.

The collective labor supply function can be developed from the many individual offer curves. By determining the quantity of effort made available by all individuals at certain wage rates, the conventional labor supply schedule is determined and an arithmetic process translates this information into a total labor supply function with "total wage bill" and "labor" as the independent variables. Figure XVI illustrates this process of aggregation. Diagram 16.1 shows the worker's indifference map and offer curve and 16.2 is the extraction of the corresponding wage levels and quantities of effort from the former diagram. Summing the individual supply schedules, such as 16.2, yields an aggregate labor supply schedule as in diagram 16.3. Calculating the total wage bill by multiplication of ΣN by W yields the total labor supply function or

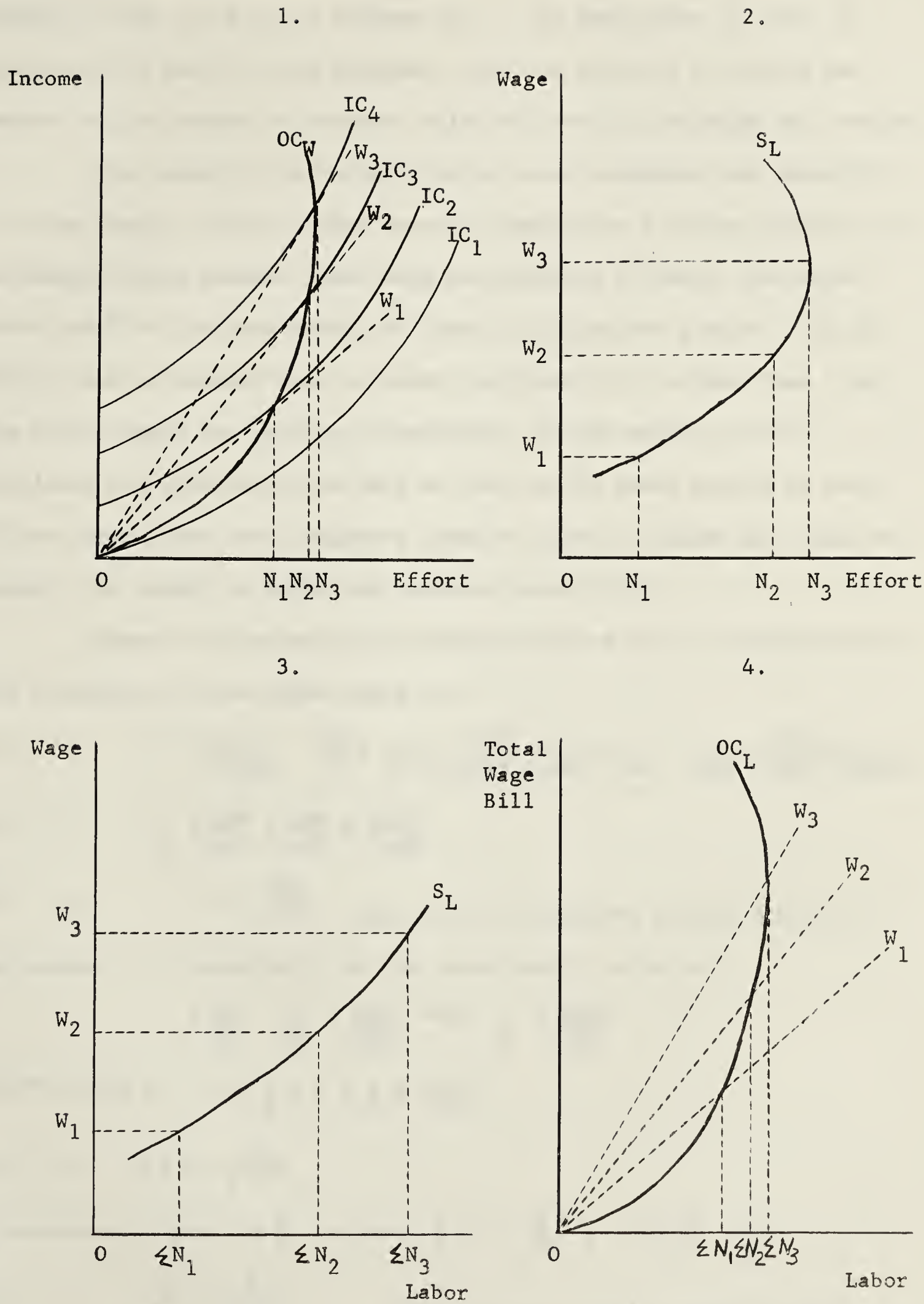

Fig. XVI. -- Derivation of aggregate workers' offer curve

workers' offer curve as in diagram 16.4. The quantities of labor in diagrams 16.3 and 16.4 are dependent upon the quantity of effort per worker and the number of workers, which may vary as the wage rate varies.

The slope of the workers' offer curve indicates the elasticity of labor supply. If the offer curve is tangent to a vector, there is an unchanging ratio between total wage and quantity of labor; the offer curve has $\epsilon = 1$ and the supply of labor is infinitely elastic. If the offer curve is steeper than a vector its elasticity is less than 1 and the labor supply has positive elasticity. If the offer curve is vertical, its elasticity, as well as that of the labor supply is zero. If the offer curve has a negative slope or positive slope less than the vector, the supply of labor has negative elasticity.

These total-average relationships can be set out algebraically. The elasticity of the offer curve is:

(1) ---- $$\epsilon = \frac{\Delta N}{\Delta(WN)} \cdot \frac{WN}{N} = \frac{\Delta NW}{(W + \Delta W)(N + \Delta N) - NW} = \frac{\Delta NW}{\Delta NW + \Delta WN + \Delta W\Delta N} .$$

(2) ---- $$\therefore \frac{1}{\epsilon} = \frac{\Delta NW}{\Delta NW} + \frac{\Delta WN}{\Delta NW} + \frac{\Delta W\Delta N}{\Delta NW} .$$

(3) ---- $$= 1 + \frac{\Delta WN}{\Delta NW}$$ since the infinitesimal product $\Delta W\Delta N$ may be ignored. The elasticity of the labor supply curve is:

$$\lambda = \frac{\Delta N}{\Delta W} \cdot \frac{W}{N} = \frac{\Delta NW}{\Delta WN} \quad \text{and} \quad \frac{1}{\lambda} = \frac{\Delta WN}{\Delta NW} .$$

Substituting in (3), $\frac{1}{\epsilon} = 1 + \frac{1}{\lambda} = \frac{1 + \lambda}{\lambda}$.

(4) ---- $$\therefore \epsilon = \frac{\lambda}{1 + \lambda} .$$

Alternatively, $\frac{1}{\epsilon} = 1 + \frac{1}{\lambda}$ becomes $\frac{1}{\epsilon} - 1 = \frac{1}{\lambda}$, $\frac{1 - \epsilon}{\epsilon} = \frac{1}{\lambda}$

(5) ---- $$\therefore \lambda = \frac{\epsilon}{1 - \epsilon} .$$ Equations (4) and (5) establish the general relationships.

SOLUTIONS

Competitive Factor Purchase.

Although the individual firm is the unit of control to be examined by the offer curve technique, it seems necessary to adapt the analysis for a comparison of the wage-employment solutions occuring in an industry when product market competitiveness changes. Rather than develop the indifference curves of a group of perfect competitors, of monopolistic competitors, of oligopolists and of a monopolistic industry, the offer curves can be directly established. Since the offer curve is the total demand function for a factor, it is possible to set out the total factor demand by an industry from the information of Chapter II. Assuming the technical conditions of production to be the same regardless of the control of the industry, the difference in shape of the offer curves is attributable entirely to behavior of the firms composing the industry. Monopolistic tendencies cause the demand for a factor to be conditioned by MR to the firm rather than AR to the industry. The offer curves of the perfect and imperfect competitors in Figure XVII differ as a result of the market structure and consequent influence of the revenue function. The offer curves of the monopolistic competitive and oligopolistic industries are ranked between the limits set by perfect competition and monopoly.

It is assumed initially that labor is in perfectly elastic supply to the industry. The workers' offer curve is a straight line, the vector OC_L. The y-axis refers to the total wage bill paid by the industry and the x-axis labelled "labor" measures total labor units

available to the industry. The marginal and average wage to these industries is constant but the quantity of labor units hired is reduced

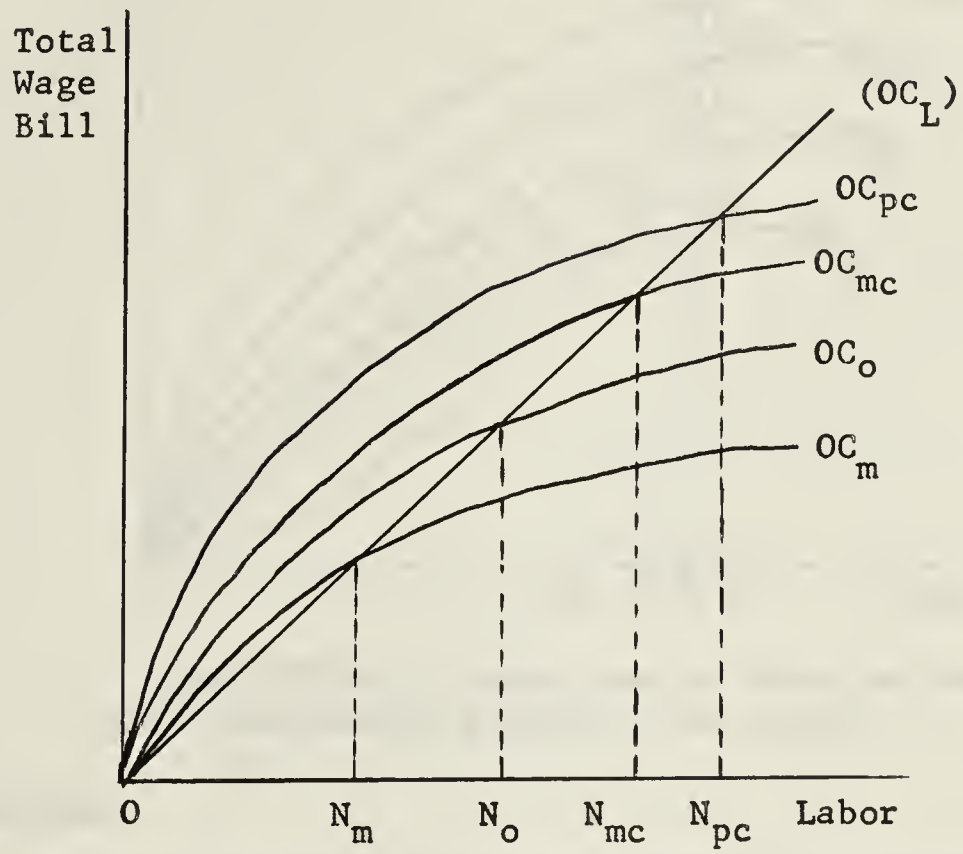

Fig. XVII. -- Comparison of levels of employment resulting from different product market forms.

as control becomes more monopolistic.

If labor is in imperfectly elastic supply to the industry, as in Figure XVIII, the wage rate paid under different degrees of competition will vary as well as the quantity of labor hired. The monopolist, in this case, is the sole employer; therefore, monopsonistic purchase by the industry exists. This comparison, is not equipped to analyze this point and is, therefore, invalid but the presence of monopsony reduces W_m and N_m and the ordinal ranking remains.

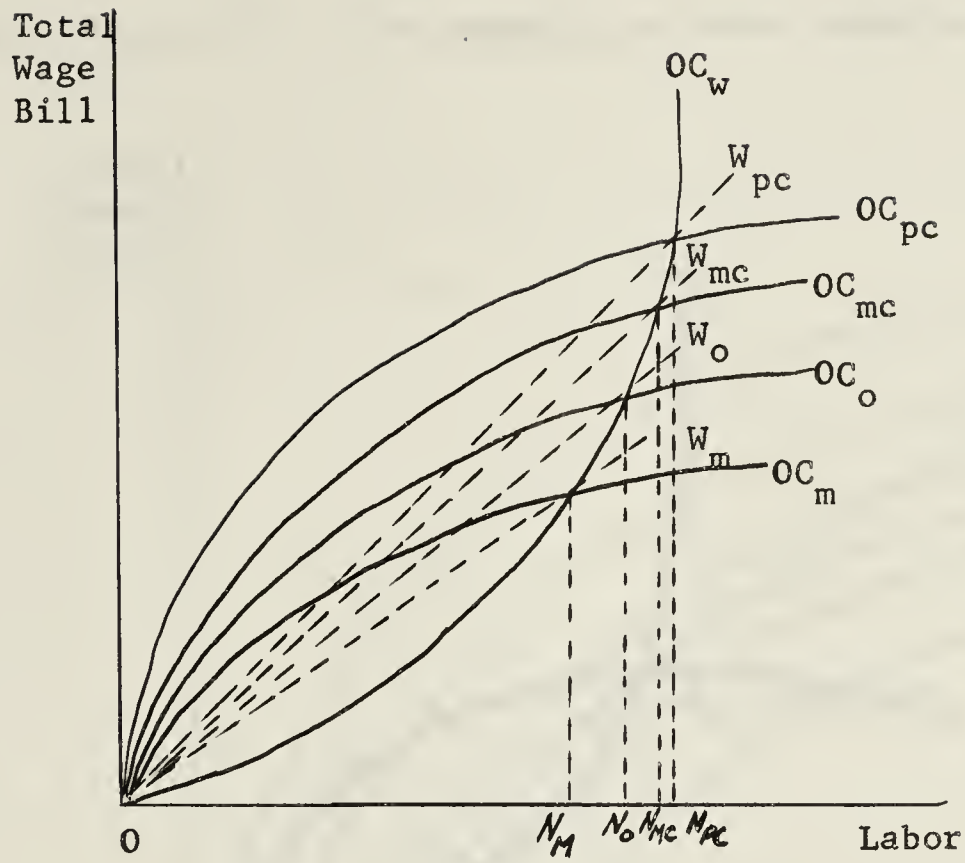

Fig. XVIII. -- Comparison of wage and employment with imperfectly elastic labor supply.

Monopsony.

Monopsonistic purchase, purchase of a factor by a single unit of control, is examined in Figure XIX. An increase in the quantity of labor demanded causes an increase in the marginal and average cost of labor to the employer. Since the employer is a single firm its indifference curves and offer curve can be set out. The collective worker offer curve (OC_w) is the total labor supply and the employer makes his purchases of labor within this constraint. Rather than pay the competitive wage W_c, this employer can increase his level of satisfaction by paying W_m, the monopsonistic rate. Tangency between OC_w and an employer indifference curve, as at "a", shows the highest level of satisfaction attainable by the employer. At "a", marginal labor cost shown by the slope of OC_w is equal to labor's MRP and is, therefore, the profit maximizing position. The average labor cost, OW_m, is smaller than MLC shown by the

slope of OC_w at "a". The quantity of labor hired by the monopsonist

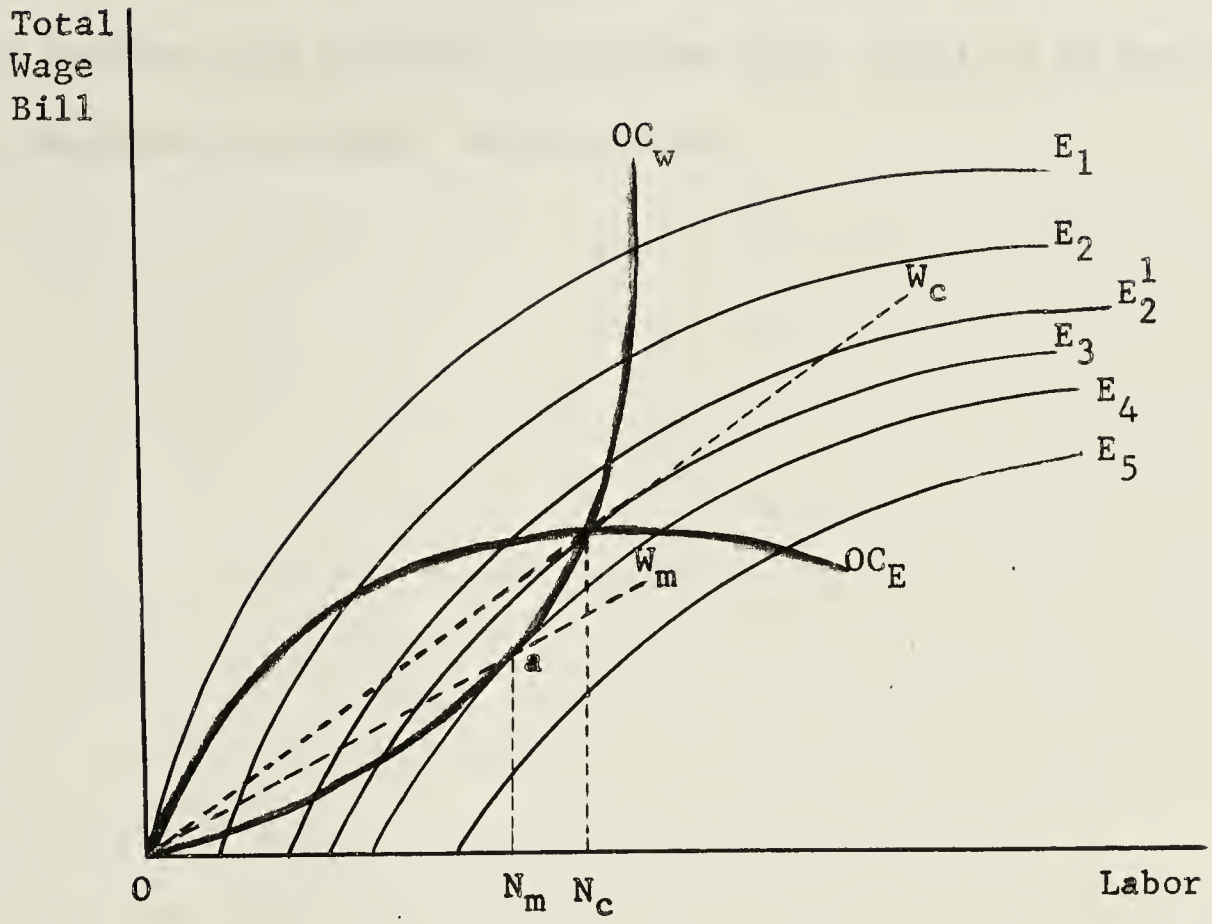

Fig. XIX. -- Monopsonistic factor purchase.

is N_mN_c less than the quantity hired under competition.

CONCLUSION.

The offer curve technique has been developed in this chapter and used to show the effects of competition in the product and factor markets. Movement from the origin along a party's offer curve represents an increase in satisfaction for that party. Conditions that cause the solution to be nearer to the origin, on an offer curve, reduce the satisfaction of the party along whose offer curve the movement occurs. In Figures XVIII and XIX, for example, the presence of monopolistic tendencies in the product and factor markets reduce the workers'

satisfaction. Monopsonistic factor purchase allows for an increase in the employer's satisfaction but it is not possible, without criteria, to determine whether this increase is greater than, equal to or smaller than the decrease in workers' satisfaction.

CHAPTER IV

BILATERAL MONOPOLY

INTRODUCTION.

Bilateral monopoly, in its strictest form, involves exchange between the sole supplier of a commodity and the sole buyer. In the labor market, in view of collective bargaining, labor-management relations contain an element of bilateral monopoly. The limiting case would be employment, by a monopsonist, of labor exclusively represented by a trade union. A variation on this arrangement is bilateral oligopoly in which few employers purchase their labor from a small number of unions. Because of certification this is an unlikely case but it is possible for an employer's association or an oligopsonistic combine to hire labor from a single union. Alternatively, oligopolistic competition among a few unions may prevail if they supply substitutable types of labor. Although oligopoly-oligopsony arrangements may be possible in the labor market, the following examination of bilateral monopoly is restricted to monopoly and monopsony in their strictest forms.

This chapter consists of application of the offer curve technique to monopoly-monopsony conditions prevailing in the labor market. While the theory of bilateral monopoly includes the dynamics of bargaining in determination of solutions, only the static aspects of the problem are examined. Imperfections give rise to a variety of solutions and bargaining is concerned with the choice of one of these

solutions. Contract theory, the subject of this chapter, is concerned with determination of the solutions consistent with certain conditions and this is the task of the chapter. The approach used involves development of a model of monopolistic and monopsonistic organizations and a discussion of the solutions.

MONOPOLY LABOR SUPPLY.

Union's Preferences.

A monopolized labor supply, or unionized labor supply, gives rise to a preference map whereas the unorganized labor supply can be

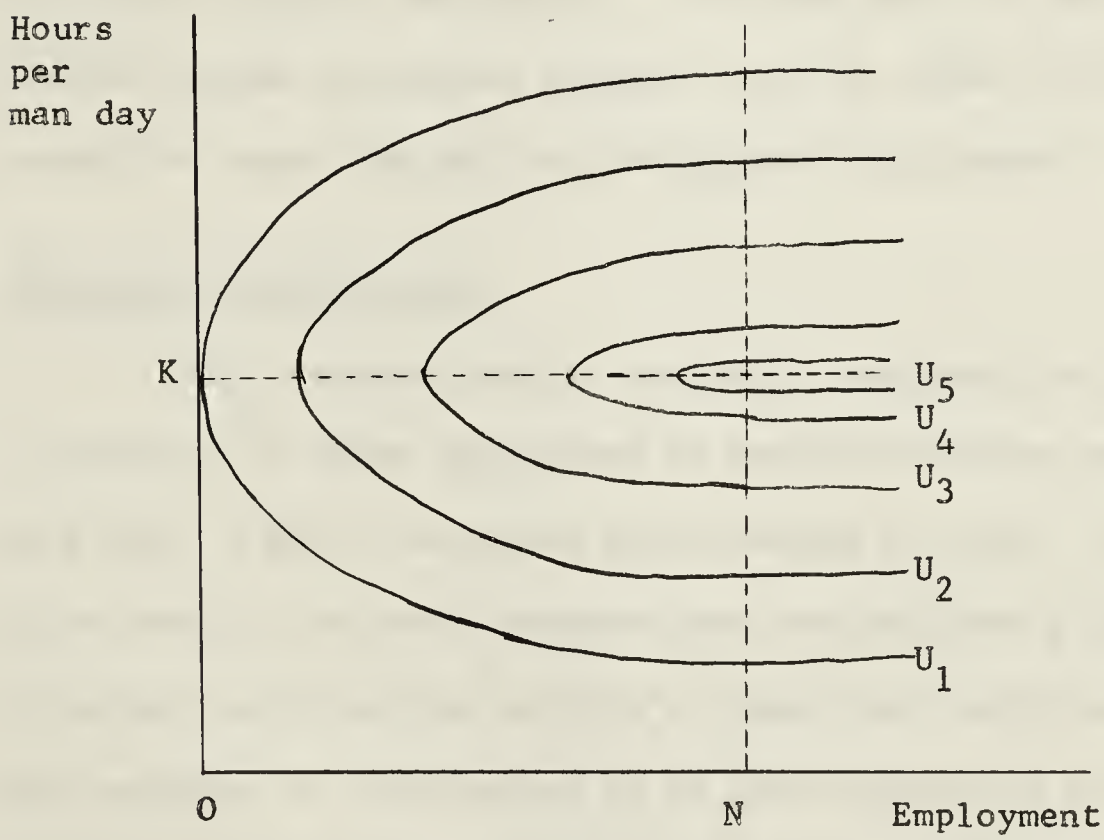

Fig. XX. -- Union's preference map.

represented diagramatically only by a supply curve because the group, as such, has no preferences. The monopoly labor supply and the monopolist's

behavior can be illustrated by a map of indifference curves, as in Figure XX. It is assumed that the union has a strong preference for expanding employment and that, in the opinion of the union, there is a certain optimum length of work day. The indifference curves U_1 to U_5 show the rate at which the union is prepared to substitute hours per man day for employment. At a constant wage rate, the union believes OK is the optimum length of work day but is prepared to have its members work more or fewer hours per day, in accordance with its preferences, if it results in more jobs. As the level of employment increases, the union becomes less willing to adjust hours per man day away from the optimum to secure further employment. For some level of employment, ON, the curves become horizontal showing that the union is not prepared to sacrifice hours per man day for greater employment.

Employer's Preferences.

At a certain rate of earnings, the employer prefers to purchase a quantity of labor determined by equality between marginal labor cost and labor's MRP or marginal significance of labor. The composition of this quantity of labor depends upon the employer's preferences for long work days and few workers or short work days and many workers. If the employer is indifferent as to the composition of the quantity of labor, rectangular hyperbolas, as in Figure XXI, represent combinations of hours per man day and numbers of men among which the employer is indifferent. With a constant wage rate, these hyperbolas are employer indifference, isoproduct and isocost curves. Given the wage rate, assume the employer would purchase a quantity of labor represented by E_3. The level of satisfaction yielded by E_2 and E_2^1 is the same although they

represent different amounts of labor the employer is forced to buy at

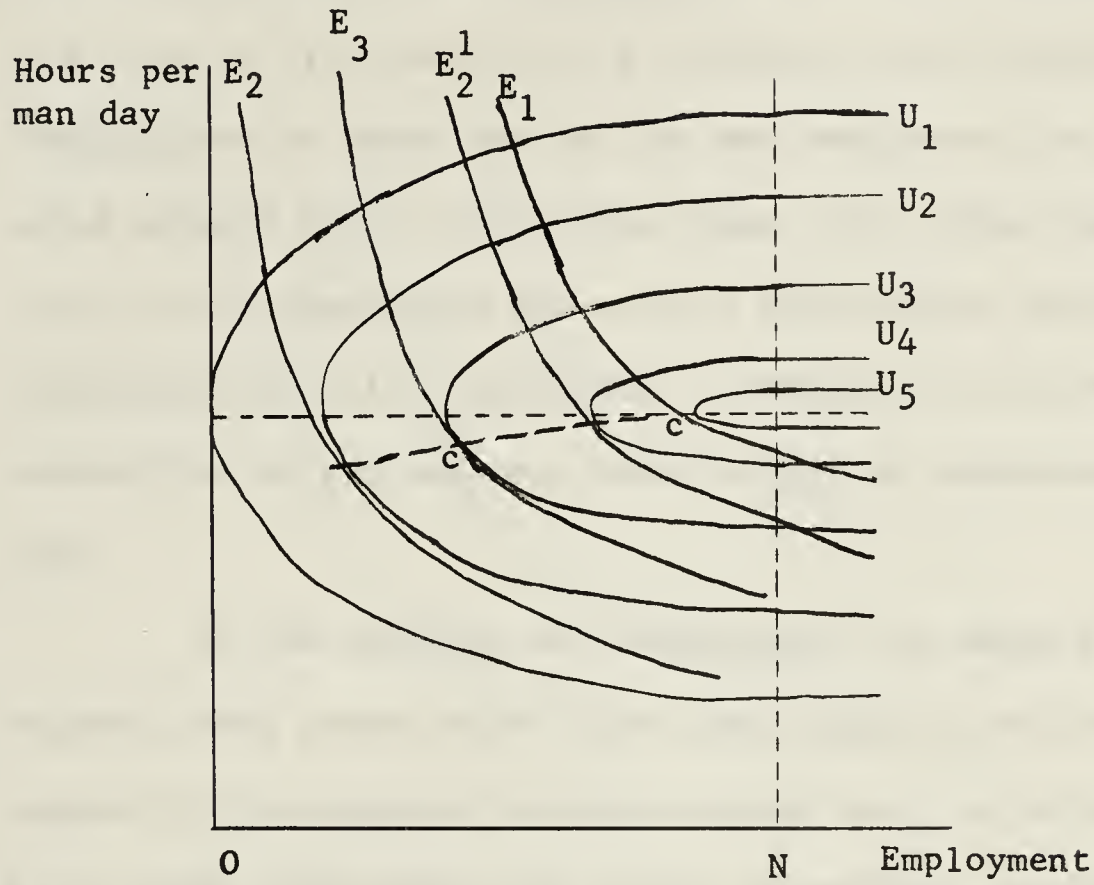

Fig. XXI. -- Determination of composition of monopoly labor supply.

the constant wage rate[1]. Since the union wants to move to the right to

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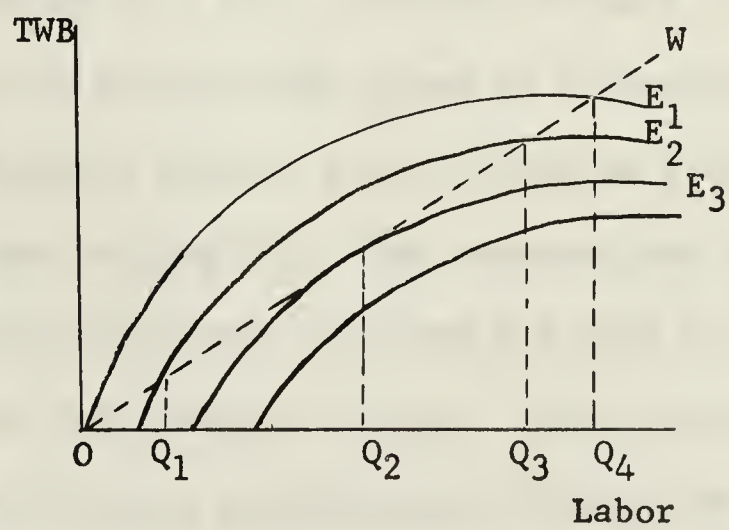
[1]These quantities of labor are illustrated as:



Q_2 above yielding E_3 in Fig. 21,
Q_1 and Q_3 yielding E_2 and E_2^1 in Fig. 21,
Q_4 yielding E_1 in Fig. 21.

higher indifference curves and the employer wants to move from E_2 to E_3, the actual range over which employer and union preferences are opposed is $E_3 - E_1$ or $U_3 - U_5$ and CC is a contract curve representing the combinations of hours per man day and employment the union and employer would bargain over. For another wage rate, these employer indifference curves would change and the union's MRS between length of work day and employment may shift; therefore, a different CC curve showing the composition of the monopoly labor supply is developed for each wage rate.

If the employer has preferences for certain lengths of work day because labor productivity rises then falls as the work day becomes longer the rectangular hyperbola serves only as an isocost curve. Figure XXII illustrates the effect of employer preferences for a certain length of work day. C_1, C_2, C_3 show combinations of man hours per day and employment that would cost constant amounts at the fixed wage rate. C_1 and C_2 represent greater quantities of labor that are inferior to C_3. From points such as x, y or z, movement along a C curve involves constant labor cost but falling TRP; along an R curve constant TRP but rising cost. Movement from x, y or z along an E curve involves falling labor cost and falling TRP. The combinations of employment and hours per man day for which total cost and TRP fall at equal rates indicate the employer indifference curves. These points of tangency, x, y and z, represent optimum combinations of hours per man day and numbers of men from the employer's standpoint. This optimality derives from the satisfied condition of minimum cost for a given output or maximum output

for a given cost. It is tangency between the E curves and the union's

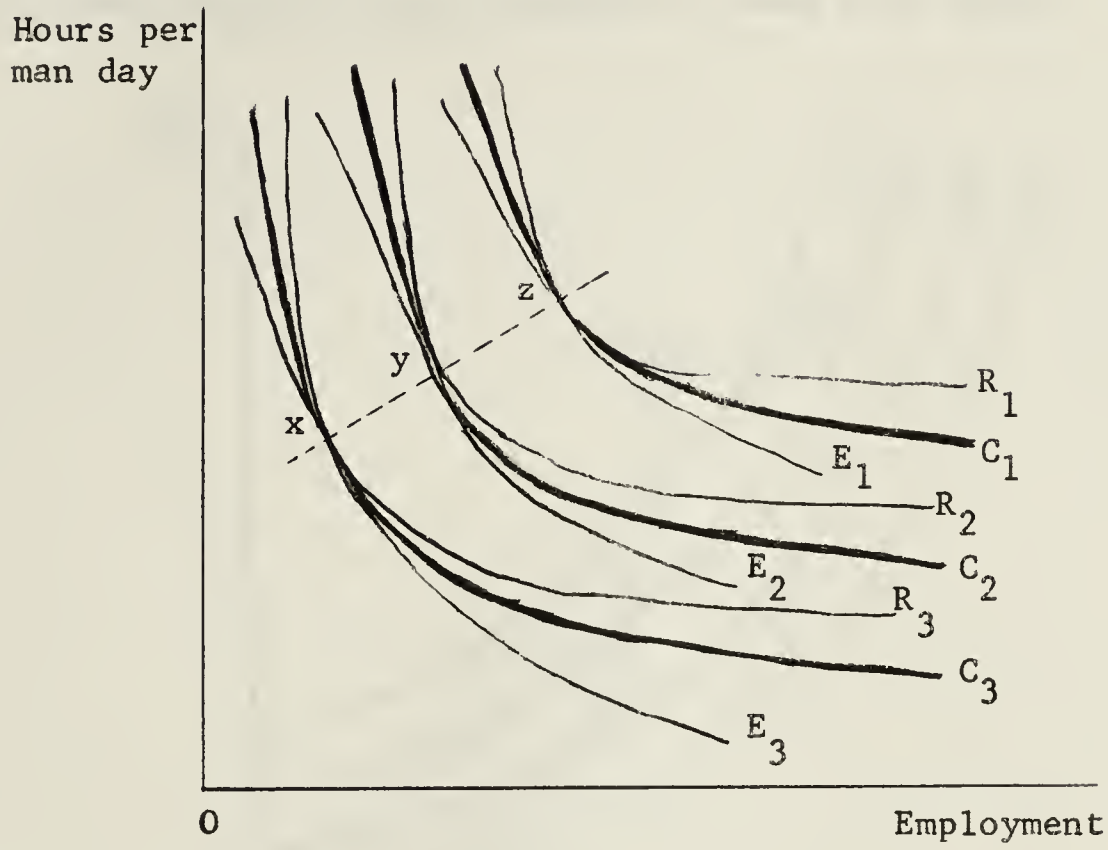


Fig. XXII. -- Employer's preferences for
certain lengths of work day.

indifference curves that determines the contract curve of Figure XXI.

The Offer Curve.

On the labor-total wage bill axes, the union's preferences appear as in Figure XXIII. For each wage rate, the composition of labor is established by the CC curve in Figure XXI arising from the appropriate indifference curves. Satisfaction increases in Figure XXIII if, for a fixed quantity of labor, total earnings rise. Tangency between vectors and indifference curves indicates optimum levels of employment at given wage rates because of equality between the marginal gain to labor and the

marginal cost in terms of foregone leisure. The union's offer curve, passing through these points of tangency, shows the equilibrium quantity of labor the union would provide at each wage level.

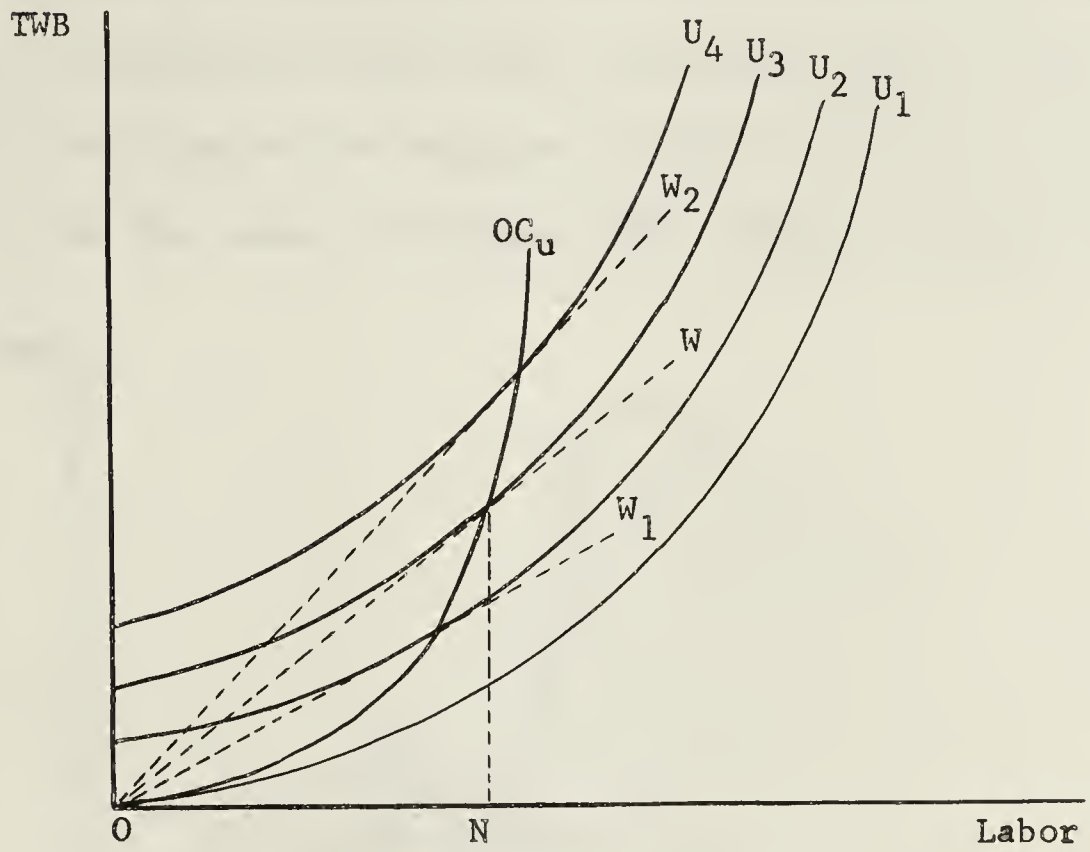


Fig. XXIII. -- Union's indifference map.

In Figure XXIII, for quantities of labor smaller than ON, the union's MRS on U_3 is smaller than the wage W, for quantity ON the union's MRS on U_3 equals W and to the right of ON on U_3, MRS is greater than W. The union's MRS, indicates willingness to sell and tangency between an indifference curve and a vector satisfies the condition of equality between marginal cost and marginal gain: tangency therefore signifies equality between willingness and ability to sell. A vector to a point on the offer curve represents the wage or average supply price to the employer, of the corresponding quantity of labor. The slope of the offer

curve equals the marginal cost of labor to the employer.

Effect of Monopoly Labor Supply.

Because the union affects the price of labor by changing the quantity of available labor units, the marginal gain to the union, shown by the slope of the employer's offer curve is the critical quantity for the union. In Figure XXIV, tangency between OC_E and U_4

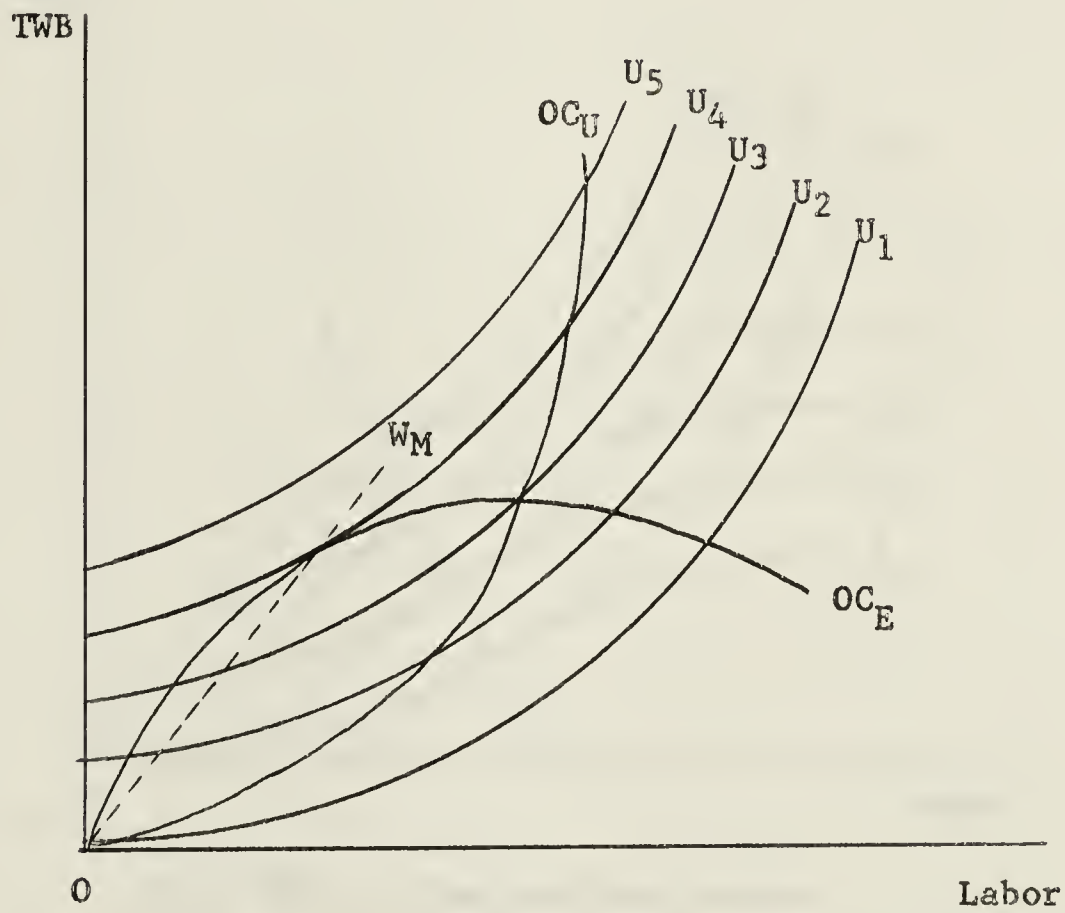


Fig. XXIV. -- Monopolistic labor supply.

signifies equality between the union's MRS and its marginal gain. The appropriate wage rate is OW_M. The intersection of the offer curves indicates equality between the demand and supply prices, the result under perfect competition.

SOLUTIONS.

The Contract Curve.

The solution of the bilateral monopoly case will clearly be a result of the conditions affecting the monopsonist and the union. These conditions are represented by the respective indifference maps which are related in Figure XXV. If the solution is to maximize satisfaction

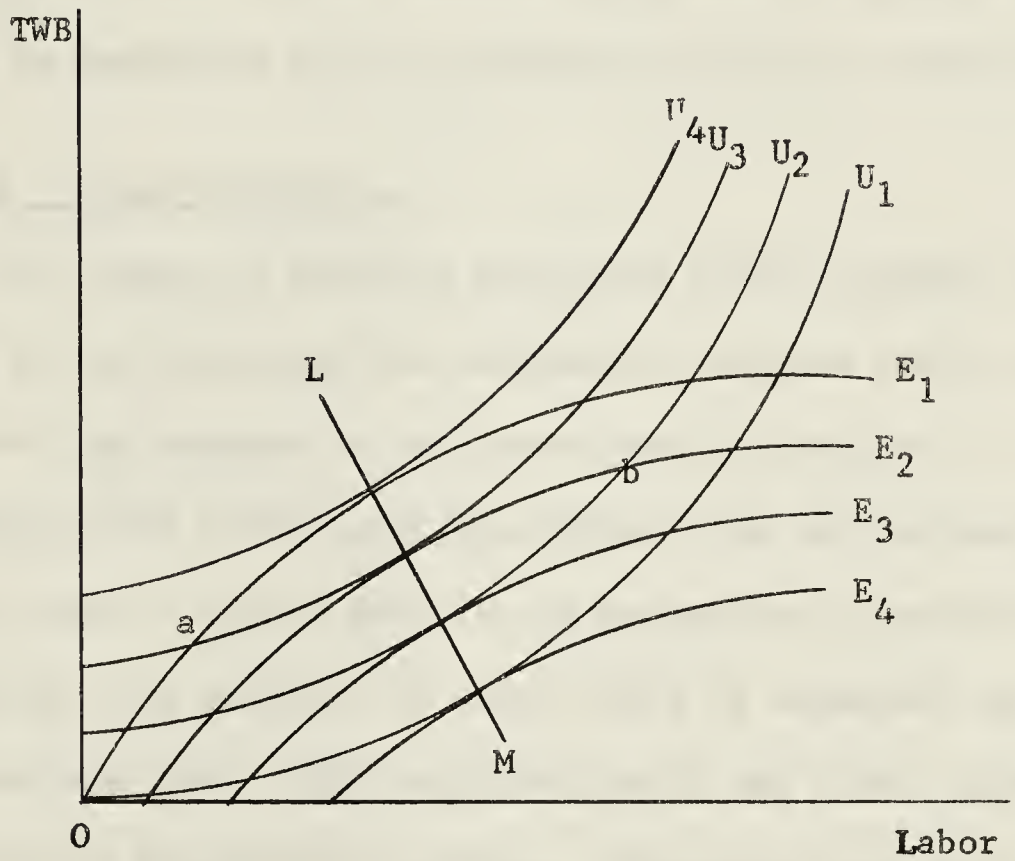


Fig. XXV. -- The contract curve.

it must be such that neither party can improve its position without adversely affecting the other. Solutions with this property lie on the labor-earnings contract curve LM and are determined by tangency of indifference curves. This contract curve is distinct from that of Figure XXI which refers only to the labor quantity. Solutions such as "a" and "b" are suboptimal combinations because movement along an

indifference curve to the contract curve enables one party to improve its satisfaction without lessening that of the other. If both parties are to be as well off as possible, the ultimate solution must be on the contract curve and intersection of the offer curves fulfills this condition. The offer curves represent, respectively, the levels of employment yielding the highest satisfaction to each party consistent with a given wage. Their intersection shows the wage at which satisfaction is maximized for both parties by the same level of employment.

Variable - labor Contracts.

The range of feasible solutions under bilateral monopoly is limited by the solutions the monopsonist and the union, acting in the absence of the opponent's influence, would establish. It is necessary to determine how these solutions differ from the optimal ones on the contract curve. Figure XXVI is the geometrical comparison. It is assumed that the quantity of labor hired is dependent upon the bargained wage rate. The intersection of the offer curves identifies the perfectly competitive solution. Monopsony purchase of labor would result in solution "a" and monopoly supply would result in "b". The divergence of W_s and W_t from W_p is a consequence of monopsony and monopoly in the labor market, and when these forces exist simultaneously, the range of possible solutions determined by bilateral monopoly is that between "a" and "b" or between W_s and W_t. It is significant that the party with market control determines a solution not on its own offer curve but this is explained by the changed conditions resulting from each

decision, The offer curve of the opponent serves as a constraint: the influential party makes its decisions in accordance with the offer curve of the submissive party.

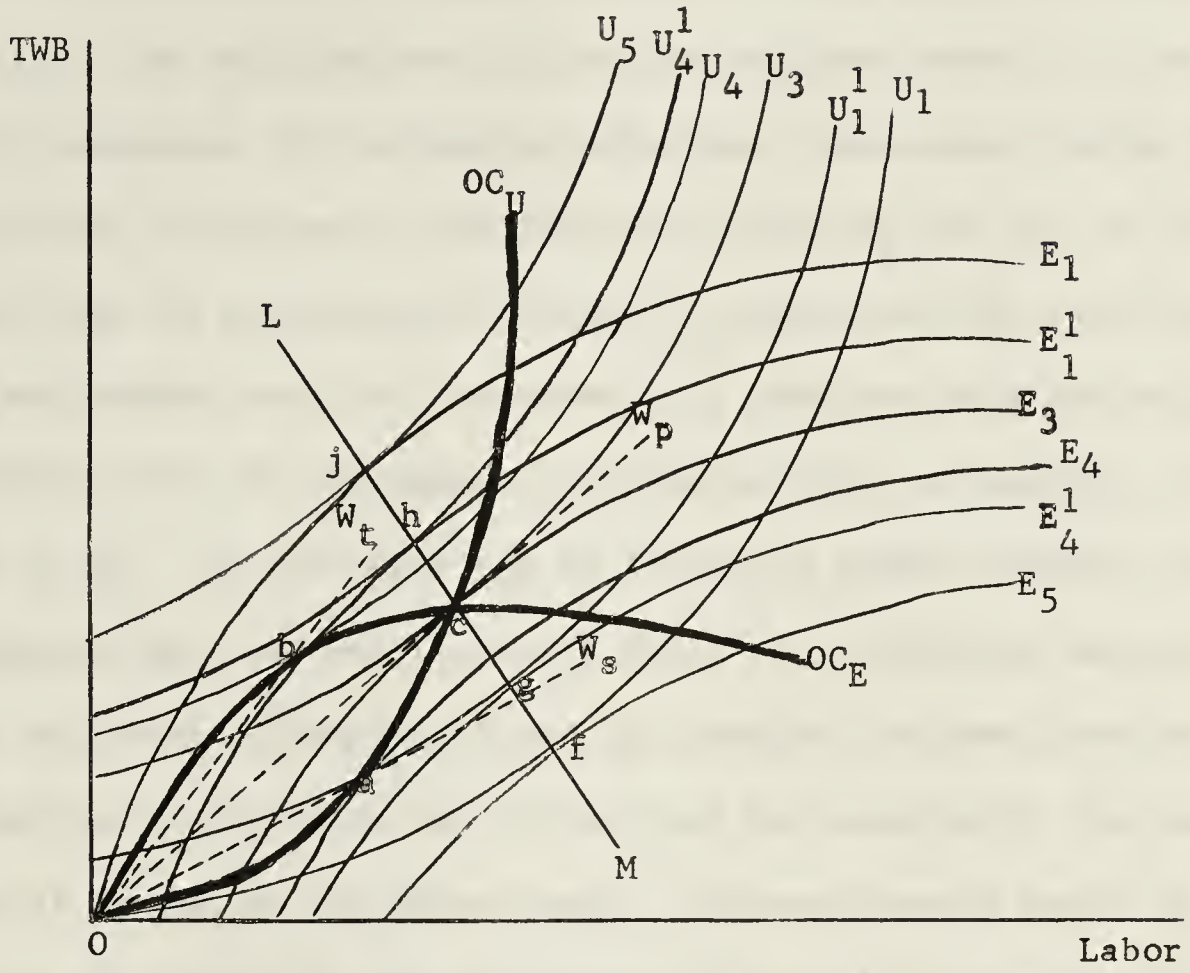


Fig. XXVI. -- Bilateral monopoly.

When both parties exert some influence over the employment contract, the net bargaining advantage determines the outcome. For instance, if the employer enjoys the superior market position, the average cost of labor to him will range between W_p and W_s. By forcing the union to accept a solution between "c" and "a", the employer is able to increase his level of satisfaction, at the expense of the union. Alternatively, if the union possesses the net bargaining advantage, it will attempt to raise the average price of labor from W_p to W_t. To the extent that the employer is forced along his offer curve towards solution "b", the union's satisfaction increases above indifference curve U_3.

All-or-None Contracts.

If the quantity of labor, as well as the price, is an issue of bargaining, the solution may fall on the contract curve. If the employer possesses the bargaining advantage, the union's level of satisfaction is limited by indifference curves U_1 and U_3. U_1 is the minimum level of satisfaction because it passes through the origin and no employment would be preferred to a position inferior to U_1. The maximum level of attainable satisfaction for the employer, then, is that of E_5. If the union can be forced to accept solution "a", the employer may improve his profit position by offering solution "g" to the union. Clearly "a" and "g" provide the same level of satisfaction to the union but "g" may not be accepted by the union because it is not on its offer curve. The conceivable range of solutions determined by the monopsonist's superior bargaining power is cf but the union cannot guarantee more work, in the bargaining process, than its members are prepared to perform.

If the union is the stronger bargaining party, the lowest level of satisfaction the employer can be forced to accept is that represented by E_1. The employer would stop production when labor's TRP no longer covered variable costs, as would be shown by lower levels of satisfaction. The union could raise its level of satisfaction to U_5 by making an all-or-none offer of "j" rather than accepting "b" and the employer could guarantee jobs. Theoretically, the range of possible all-or-none contracts when the union has the bargaining advantage is cj.

WELFARE ASPECT.

The offer curve model may also be used in an examination of the welfare implications of collective bargaining. Were it possible to determine the indifference curves giving rise to each employment contract, the satisfaction frontier for the participants could be established. Alternatively, given the nature of a contract, relative to the theoretical model, it may be possible to infer the level of satisfaction each party attains. The extent to which the theoretical satisfaction frontier is reached reflects on the contracting parties.

Figure XXVII demonstrates the means by which the satisfaction frontier of the contracting parties may be established. The perpendiculars from the axes correspond to the respective indifference curves from Figure XXVI. The points of tangency between indifference curves appear as intersections between the appropriate perpendiculars in Figure XXVII and the contract curve, LM, is now U_5E_5, the satisfaction frontier. As was seen, solutions when price and quantity are bargained may fall on the contract curve and, therefore, the satisfaction frontier. If price only is bargained, the solution falls on the satisfaction frontier only under perfect competition, as at "c", and the effective frontier in this case is bca. Since all-or-none contracts consistently maximize satisfaction, it is suggested that the frequency of price-quantity negotiations indicates an awareness of this on the parts of unions and employers.

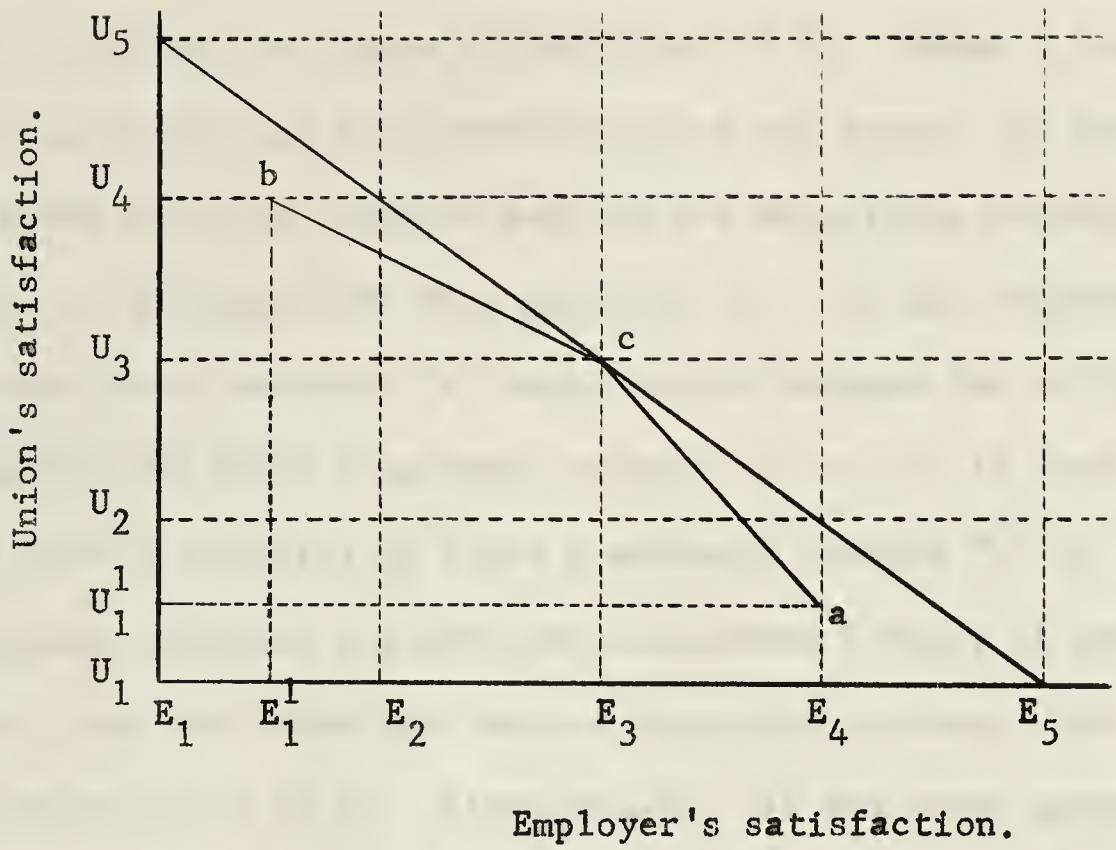


Fig. XXVII. -- Satisfaction frontier of collective bargaining.

Welfare considerations, in this model, must be limited to those of the union and the employer since the consumer is not brought into the model. Partial welfare, however, is maximized when a solution falls on the satisfaction frontier. The distribution of this partial welfare, or the level of satisfaction attained by each party, under each set of circumstances, is determined by net bargaining power and the bargained issues. To determine the community's welfare, an assessment of the effect on the consumer of monopoly-monopsony in the labor market would be required.

CONCLUSIONS.

When the quantity of labor is a dependent variable of the collective bargain, the possible solutions range, in Figure XXVI, between "a" and "c" and between "b" and "c", depending upon the relative strength of the employer and union. If all-or-none contracts

can be fulfilled, the range of solutions is fj. After a collective bargain is struck and its characteristics are known, its position on the diagram could be inferred and the net bargaining advantage measured by the departure from position "c". If net bargaining power were zero, solution "c" would result because the ability of the employer to force a movement towards "a" or "f" is just offset by the union's capacity to force a movement towards "b" or "j". If the contract contains a guaranteed employment clause, it may be inferred that the union has the net bargaining strength and that the solution falls on cj. Alternatively, if the union agrees to a longer working day than it asked for, it may be inferred that the employer exercises net bargaining power and that the solution falls on cf.

CHAPTER V

CONCLUSIONS

THE OFFER CURVE TECHNIQUE.

Contract theory, presented in the form of the offer curve model has been applied to the labor market. The synthesis from preferences of individual decision-makers presents the nature of solutions arising in the labor market. An examination of certain of the circumstances giving rise to an employment contract has been undertaken but these circumstances are purely of a static nature. The dynamics of bargaining, of bringing to bear these circumstances to arrive at a solution, are not considered. Static contract theory is distinguished from dynamic bargaining theory by the offer curve model and its descriptions. Bargaining theories are identifiable by their content, the explanations of how a solution is arrived at: contract theory may be identified by the examinations of solutions' environments.

VALUE OF CONTRACT THEORY.

Using the offer curve model as an example, the usefulness of static analysis may be illustrated. The development of the technique required examination of many detailed points, such as the effect of monopoly, and the model, as such, assists in explaining the nature of solutions. Static models, in general, assist in explaining and understanding concepts. This thesis has

established the ranges within which feasible solutions would fall and the effect of two types of negotiations. It has been shown that price-quantity bargaining makes possible levels of joint satisfaction at least as high as price only bargaining. It remains for bargaining models to examine the forces and techniques that narrow the determinate range to a determinate solution.

A model of the type presented in the thesis may be useful, unilaterally, in assisting a bargaining party understand its opponent's requests. A union considering the requests from an employer may be influenced by its understanding of the employer's offer curve, as the employer may be affected by the union's offer curve. Were it possible to collect data to develop indifference curves, either party could determine the ultimate contract but, in the absence of perfect knowledge and presence of rational behavior, estimates of the necessary data may be made. The accuracy of these estimates would improve the knowledge of the bargaining party and its success in negotiations.

Perhaps the more productive use of the offer curve model would be the making of inferences from known results. The existence of an employment contract and knowledge about its characteristics makes it possible to locate the solution on an offer curve diagram. From the known results, inferences can be drawn about the necessary circumstances surrounding the contract. These circumstances would include, for example, net bargaining power and presence of monopoly power. Differences between initial offers and final results would begin to indicate preferences

between labor cost and labor quantity, and in the case of all-or-none contracts, the preferences for composition of the quantity of labor. Inferences from past negotiations may act as checks on estimates made for future negotiations.

RELATED PROBLEMS.

During the preparation of the thesis, problems related to the subject were recognized but were not examined since they are not essential to the model. For instance, the propensity of unions to include fringe benefits in the earnings portion of their requests from the employer could be partially considered by the offer curve model. If, in fact, a part of labor's earnings are received in the form of non-wage payments "total labor cost" may be substituted for "total wage bill" on the y-axis of the appropriate diagrams. While this may be adequate from the point of view of the employer, it is possible that the union's satisfaction from types of fringe benefits is not conditioned by monetary cost. Among combinations of fringe benefit packages costing an equal amount, the union may have preferences although these would not affect the employer. The inadequacy of the model, as presented in the thesis, is that it does not provide a complete description of the variables in the employment contract.

Although the welfare implications, in general, have not been examined, it was suggested that the partial welfare enjoyed by the employer and employees may be determined from the contract curve. An examination of the relationship between the employer-producer and the consumers, in conjunction with this model, may provide the

foundation for determining community welfare for any given set of circumstances. It may also be possible to indicate the effect on welfare of various competitive conditions in the factor and product market.

The ex post measure of bargaining power illustrated in the previous chapter may provide the means for relating contract and bargaining theory. Use of bargaining theory in analysis of certain aspects of negotiations may be facilitated if the magnitude of net bargaining power exercised is provided by the offer curve model. Similarly, estimates of preferences made by inference from the offer curve model could be useful data in assessing the success of offers and counter-offers made during negotiations.

Many simplifying assumptions have been made that contribute to the abstract nature of the model. The offer curve technique has been developed on this basis but a detailed examination of the effects of relaxing certain assumptions has not been undertaken. While the thesis is essentially a consideration of a series of theoretical points, it might suggest an approach for examining many practical problems.

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